



Municipality of Singapore

Health Department

ANNUAL REPORT

for

1932

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1933.



MUNICIPAL HEALTH OFFICE.

MUNICIPAL HEALTH OFFICE,

Singapore, 25th March, 1933.

THE PRESIDENT,

MUNICIPAL COMMISSIONERS,
SINGAPORE.

SIR,

I have the honour to submit my report for 1932.

I. ZYMIC DISEASES.

1,660 cases were notified compared with 1,416 in 1931 and 1579 in 1930.

The following table shows the comparison between the year under review and the previous 10 years.

Year	Enteric Fever	Diphtheria	Chicken-pox	Puerperal Fever	Erysipelas	Cerebro Spinal Fever	Paratyphoid Fever	Small-pox	Plague	Cholera	Typhus Fever	Scarlet Fever	Tuberculosis	Total
1922 ..	68	52	127	16	7	32	2	268	39	1	—	—	169	781
1923 ..	63	37	188	12	14	9	1	3	52	—	—	—	409	788
1924 ..	64	38	230	22	9	16	—	9	20	11	—	—	331	750
1925 ..	136	51	31	14	2	10	2	10	59	1	—	—	365	681
1926 ..	197	46	169	25	14	6	1	34	7	22	1	1	642	1,165
1927 ..	235	29	193	22	5	17	7	19	4	30	—	—	733	1,294
1928 ..	230	59	350	11	8	15	12	9	5	9	1	3	808	1,520
1929 ..	133	57	577	13	8	3	—	9	3	—	—	6	904	1,713
1930 ..	156	63	349	11	9	22	2	—	—	—	—	2	965	1,579
1931 ..	150	65	211	28	6	8	1	3	—	—	—	—	944	1,416
Average for 10 years ..	143.2	49.7	242.5	17.4	8.2	13.8	2.8	36.4	18.9	7.4	.2	1.2	627.0	1,168.7
1932 ..	114	124	542	16	2	6	1	8	—	—	—	1	846	1,660

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The following table shows the incidence by nationalities:—

DISEASE	Europeans	Eurasians	Chinese	Malays	Indians	Others	TOTAL
Enteric Fever	5	7	76	6	13	7	114
Diphtheria	5	7	101	9	1	1	124
Chicken-pox	3	25	82	24	405	3	542
Puerperal Fever	—	—	10	5	1	—	16
Erysipelas	—	—	1	—	1	—	2
C. Spinal Fever	—	—	3	—	3	—	6
Paratyphoid Fever	1	—	—	—	—	—	1
Small-pox	—	3	—	5	—	—	8
Tuberculosis	1	19	635	46	130	15	846
Scarlet Fever	—	—	1	—	—	—	1
Total	15	61	909	95	554	26	1,660

The following return shows the number notified for each month of the year:—

DISEASE	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
Enteric Fever	8	10	15	14	11	10	7	7	8	3	4	17	114
Diphtheria	16	10	8	5	12	6	18	10	10	5	14	10	124
Chicken-pox	70	70	78	40	46	19	28	18	41	47	34	51	542
Puerperal Fever	1	1	2	1	2	2	—	1	2	1	1	2	16
Erysipelas	—	—	—	—	—	1	—	1	—	—	—	—	2
C. Spinal Fever	—	—	1	—	—	1	—	2	1	1	—	—	6
Paratyphoid Fever	—	—	—	—	—	—	1	—	—	—	—	—	1
Small-pox	2	4	2	—	—	—	—	—	—	—	—	—	8
Scarlet Fever	—	1	—	—	—	—	—	—	—	—	—	—	1
Tuberculosis	72	68	62	75	79	80	70	62	67	69	71	71	846
Total	169	165	167	135	150	119	124	101	129	126	124	151	1,660

Our continued freedom from the three dangerous infectious diseases, Cholera, Plague and Small-pox is nothing short of remarkable. The last case of Cholera was in 1928, the last one of Plague in 1929, while during the year under review there were only 8 cases of Small-pox.

The first case of these latter was reported on January 28th, the patient being a Eurasian boy of 5 years. The contacts were vaccinated and removed to Middleton Hospital. Vaccination was too late, however, to protect all of them—the father and younger sister contracting Small-pox. The former succumbed to the disease.

Following a search, a Malay aged 45 years was found living in concealment practically recovered from Small-pox. It was established that he had been living next door to the first case when he developed the disease but removed to another house. When he recovered, both he and the chief tenant of this second house were prosecuted, convicted and fined. Though this second case was responsible for the first and of course the third and fourth cases, it was impossible to connect him with any previous case.

On 3rd February, a Malay was found at 67 Sungei Road suffering from the disease. He refused to give any account of his previous movements.

On 6th March, two more cases, both Malay fisherman were found at 189 East Coast Road. They stated they had just come from Trengganu. Neither had been vaccinated and both succumbed.

The last case was that of a Malay child discovered accidentally by one of the Infant Welfare Health visitors at the Police Barracks Sepoy Lines. The father of the child, a Police constable, was prosecuted for concealment, convicted and fined. He stated that the child contracted the disease while on a visit to Malacca.

While on the subject of Small-pox, I may mention that the total number of births during the year was 16,589. There were 15,694 vaccinations notified and as most of these were primary, it may be assumed that the vaccination state of the infant population is satisfactory.

In connection with Plague, in accordance with the international agreement, rat examination was continued throughout the year. 5,996 rats were trapped and dissected in the laboratory. None were found plague infected. Only 3,573 fleas were enumerated on these rats or 60 fleas to 100 rats. There can be no question, I think, but that we owe much if not all of our immunity from Plague to this fact.

TYPHOID AND PARATYPHOID FEVERS.

115 cases (one Paratyphoid) were notified but 58 deaths from this group were recorded, so that I am constrained to repeat as in former years that the notifications are no indication of the real incidence of the disease. Also, as in former years, the cases were spread pretty evenly over the year, and no district was specially attacked showing that there was no common source of infection, but that each case was contracted through the medium of a previous case or a "carrier," in all probability the latter. All cases were followed up as usual investigated, but only in two instances could any connection between cases be surmised—two in one house in one day, and two in adjoining houses on consecutive days. In the latter instance the only common factor in the two households was that food was obtained from itinerant hawkers.

TUBERCULOSIS.

There were 846 notifications but 1,088 deaths. This represents 11.47% of all deaths. The corresponding figures for 1931 were 1377 and 12.25%. Of the 1,088 deaths, 1,001 were due to Phthisis.

DIPHTHERIA.

124 cases were notified. In my opinion this figure gives little indication of the real incidence of this disease. Quite apart from the fact that this is double the number of last year, there are many other disquieting signs that not only is this disease far more prevalent than the figures would show, but it is progressively increasing both in numbers and in virulence. Fuller reference to this will be found in Dr. Gilmour's reports on the Bacteriological laboratory and Middleton Hospital.

The practice was continued of taking throat swabs from the throats of all children under 10 years of age, who had died without being seen in life by a medical man. 884 such swabs were examined and in 19 of these the Diphtheria bacillus was demonstrated. 8 of the children were under 1 year of age and 17 under 5 years. Needless to say none of these were certified as having died of Diphtheria.

Though there is as yet no occasion for undue alarm, the situation must be closely watched. The assistance of the Infant Welfare Branch has been invoked and the Health Visitors will in future look out for throat cases even in older children, and where possible will take a throat swab in all doubtful cases. Steps have been taken too to follow up all known cases rather more closely and, where necessary, swabbing of contacts, prophylactic inoculation of other children and even quarantining etc. will be enforced. There is still a lamentable tendency on the part of practitioners, and of course parents, to take this disease rather lightly and to put off bacteriological examination until it is too late. As instance of this, Dr. Gilmour reports that 21 laryngeal cases admitted to Middleton Hospital required immediate tracheotomy.

None of the other infectious diseases call for special comment.

GENERAL.

1. Medical inspection of Passengers.

30 permits to land were granted to 51 passengers, 7 of whom failed to report.

2. Disinfection of infected articles.

1,885 articles were disinfected—the steam disinfecter was used on 15 occasions only.

3. Houses quarantined and disinfected.

Two houses were quarantined. 572 houses (phthisis cases 300) were disinfected.

4. Infected persons and contacts.

283 people were removed to Middleton Hospital. 27 bodies were buried under supervision.

II. MIDDLETON HOSPITAL.

At the end of the year there were 39 patients remaining in hospital while during the year under review there were 724 admissions making a total treated of 763. Of these, 697 were discharged, 38 died, while 28 remained in hospital at the end of the year.

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III. VACCINATION.

The following vaccinations were reported.

	Successful	Modified	Failed	Not Seen	TOTAL
Municipal Vaccinators ..	11,694	29	20	134	11,877
Private Vaccinators ..	929	—	1	4	934
Medical Men ..	2,877	—	6	—	2,883
Total ..	15,500	29	27	138	15,694

Of the total number of 11,877 vaccinations performed by the Municipal Vaccinators, 99% of those seen for the second time were found to be successful.

The nationalities of those vaccinated by Municipal Vaccinators were Europeans 19, Eurasians 187, Chinese 9,313, Malays 1,508, Indians 642 and Others 208. Of these, 6,216 were males and 5,661 females of the following ages:—

Under 1 year	..	..	..	9,747
1 to 2 years	..	..	..	367
2 to 5 "	..	..	..	451
5 to 10 "	..	..	..	423
10 to 20 "	..	..	..	361
Over 20 "	..	..	..	528
				—
			Total ..	11,877
				—

8,641 vaccinations were performed at our depots, 2,076 at Police Stations, 482 in the Child Welfare Clinics, 20 in Schools, and 295 in private houses. In addition, 363 contacts were vaccinated.

VITAL STATISTICS.

The following statistics are calculated on an estimated mean annual population of 470,271 made up as follows:—

	Male	Female	Total
Europeans ..	4,200	2,449	6,649
Eurasians ..	2,977	3,258	6,235
Chinese ..	224,379	137,733	362,112
Malays ..	24,258	20,688	44,946
Indians ..	35,308	7,198	42,506
Others ..	4,489	3,334	7,823
	—	—	—
Total ..	295,611	174,660	470,271
	—	—	—

In my 1931 Report, I discussed at some length the question of the number of children who were not enumerated at the Census, and I gave my reasons for adding to the permanent population a total of rather over 19,000 who, in my opinion, were so missed. Since then I have had the pleasure of seeing the interesting report of the officer who conducted the Census, and have read his masterly arguments and his "reconciliation"

statement to prove that these children were not missed, but were carried forward to the subsequent age groups. But, on the other hand, I have taken out all the age-groups for both Straits born and Foreign born and the discrepancies of especially the death rates in these, convince me that the children were missed and were not carried forward. It is significant, too, that recent counting of heads in many blocks of the town, made by the Sanitary Inspectors in the ordinary course of their duties, nearly always reveals a much higher child population than the Census schedule showed.

I also stated in my 1931 Report that in future it was decided to abandon the method of estimating the population in inter censal years by geometrical progression, and simply to add the excess of births over deaths plus the proportional increase of immigration over emigration to the mean annual population for the preceding year. No figures for the latter were received so that the population for the year under review is simply the 1931 population plus the excess of births over deaths, which was 7,109.

The following return gives the population, the number and rates per 1,000 births, infantile deaths and deaths at all ages for the past 10 years:—

Year	Population	Births		Infantile Deaths		Deaths at all ages	
		No.	Rate	No.	Rate	No.	Rate
1922 ..	362,597	10,368	28.59	2,488	239.9	11,553	31.86
1923 ..	373,513	10,757	28.79	2,431	225.9	10,049	26.90
1924 ..	384,758	11,757	30.55	2,614	222.3	10,420	27.08
1925 ..	396,341	12,363	31.19	2,600	210.3	11,184	28.21
1926 ..	408,273	12,871	31.52	2,987	232.0	13,085	32.04
1927 ..	428,153	14,152	33.05	3,221	227.6	14,165	33.08
1928 ..	442,454	15,540	35.12	3,142	202.1	12,584	28.44
1929 ..	479,723	17,551	36.58	3,467	197.5	12,576	26.21
1930 ..	495,818	17,702	35.70	3,877	219.0	13,748	27.73
1931 ..	445,719	16,488	36.99	3,369	204.3	11,233	25.20
Average for 10 years ..	421,735	13,955	32.81	3,020	218.1	12,060	28.67
1932 ..	470,271	16,589	35.28	2,994	180.5	9,480	20.12

I. BIRTHS.

The total number of births registered during the year was 16,589 compared with 16,488 in 1931 and 17,702 in 1930.

There were 8,604 males and 7,985 female births.

The crude birth rate was 35.28 per mille as compared with 36.99 in 1931 and 35.70 in 1930.

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The following return gives the number of births and the birth rate for each month of the year:—

MONTH	Births	Birth Rate	MONTH	Births	Birth Rate
January ..	1,180	30.11	July ..	1,371	34.98
February ..	1,179	30.08	August ..	1,423	36.31
March ..	1,322	33.12	September ..	1,421	36.26
April ..	1,388	35.42	October ..	1,428	36.44
May ..	1,498	38.23	November ..	1,457	37.18
June ..	1,462	37.31	December ..	1,460	37.26

The following return shows the number of births for each nationality:—

	Males	Females	Total
Europeans ..	86	77	163
Eurasians ..	97	82	179
Chinese ..	6,845	6,343	13,188
Malays ..	894	825	1,719
Indians ..	563	548	1,111
Others ..	119	110	299
Total ..	8,604	7,985	16,589

There were 467 still births compared with 493 in 1931 and 483 in 1930.

II. DEATHS.

The total number of deaths for the year was 9,480 and the death rate 20.12 per 1,000 compared with 25.20 in 1931 and 27.73 in 1930.

237 persons died who had been less than 3 months resident in Singapore. Deducting these, the death rate is reduced to 19.65.

The excess of births over deaths was 7,109.

The following return shows the number of deaths and the death rate for each month of the year:—

MONTH	Deaths	Death Rate	MONTH	Deaths	Death Rate
January ..	868	21.75	July ..	775	19.42
February ..	784	21.00	August ..	702	17.59
March ..	733	18.37	September ..	748	19.37
April ..	842	21.80	October ..	816	20.44
May ..	838	21.00	November ..	791	20.48
June ..	833	21.57	December ..	750	18.79

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The death rates for the different nationalities were:—

	1932			1931		
	Males	Females	Total	Males	Females	Total
Europeans	..	9.05	3.27	6.92	6.93	5.84
Eurasians	..	12.76	13.20	12.99	20.49	12.65
Chinese	..	21.05	20.29	20.76	27.38	25.56
Malays	..	23.82	23.97	23.89	26.74	26.12
Indians	..	12.91	27.78	15.43	14.27	34.45
Others	..	14.25	12.30	13.42	16.17	14.27
Total	..	19.94	20.51	20.12	25.18	25.24
						25.19

The following return gives the number of deaths from each cause of disease, by nationality, age and sex. The classification followed is that of the 1926 International List:—

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

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MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

(10-D)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

(11-D)

I. General Diseases—(contd.)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

General Diseases—(Contd.)

I. General Diseases—(Contd.)		Nationality.		Brought forward												TOTAL																						
				Under 3 Months			3 to 12 Months			1 to 5 Years			5 to 10 Years			10 to 15 Years			15 to 20 Years			20 to 25 Years			25 to 35 Years			35 to 45 Years			45 to 55 Years			Over 55			Unknown	
	b Chronic or unstated.			Europeans	..	78	53	36	23	45	59	42	44	23	21	45	17	110	38	343	133	354	132	380	85	158	67	1,614	672	1,614—672						
7.	Disseminated tuberculosis (continued).			Eurasians																																		
				Chinese																																		
				Malays																																		
				Indians																																		
				Others																																		
				Europeans																																		
				Eurasians																																		
				Chinese																																		
				Malays																																		
				Indians																																		
				Others																																		
				Europeans																																		
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				Eurasians			</																															

II. General Diseases not included above.

(13-D)

III. General Diseases not included above—(contd.)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

(14-D)

III. General Diseases not included above—(Contd.)

b. Lymphadenoma

a. Leukæmia.

35. Leukaemia,
Lymphadenoma.

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

(16-D)

III. Diseases of the Nervous System and Sense Organs—(contd.)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

(18-D)

III. Diseases of the Nervous System and Sense Organs—(contd.)

I. Diseases of the Nervous System and Sense Organs—(Contd.)

V. Diseases of the Circulatory System.

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

IV. Diseases of the Circulatory System—(contd.)		Nationality.		Mortality												Grand Totals													
				Under 2 Months		3 to 12 Months		1 to 5 Years		5 to 10 Years		10 to 15 Years		15 to 20 Years		20 to 25 Years		25 to 35 Years		35 to 45 Years		45 to 55 Years		Over 55		Unknown		TOTAL	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
89. Angina pectoris.																													
	Brought forward	329	275	252	220	123	138	52	54	32	25	56	29	153	66	511	203	559	214	603	149	266	131	...	...	2,941	1,504	2,941—1,504	
	Europeans	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Eurasians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Chinese	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Malays	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Indians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	1—0																												
90. Other diseases of the heart.																													
	(1) Aortic valve disease.																												
	(2) Mitral valve disease.																												
	(3) Aortic and mitral valve disease.																												
	(4) Other or unspecified valve disease.																												
	(5) Fatty heart.																												
	(6) Dilatation of heart (cause unspecified).																												
	(7) Other or unspecified myocardial disease.																												
	Carried forward	330	275	252	220	123	138	52	54	32	25	56	29	163	68	518	205	582	218	646	161	298	137	...	...	3,052	1,530	3,052—1,530	

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

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MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932:

Diseases of the Respiratory System—(contd.)

Diseases of the larynx
(1) *Laryngismus stridulus*.

a. Acute bronchitis.

• & d. Bronchitis not distinguished as acute or chronic.

00. Broncho-pneumonia.

01. Pneumonia, lobar, or not otherwise defined

1. Emotions

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V. Diseases of the Respiratory System—(contd.)												Grand Total
Nationality.	M	F	M	F	M	F	M	F	M	F	M	F
Under 3 Months	M	F	M	F	M	F	M	F	M	F	M	F
3 to 12 Months	M	F	M	F	M	F	M	F	M	F	M	F
1 to 5 Years	M	F	M	F	M	F	M	F	M	F	M	F
5 to 10 Years	M	F	M	F	M	F	M	F	M	F	M	F
10 to 15 Years	M	F	M	F	M	F	M	F	M	F	M	F
15 to 20 Years	M	F	M	F	M	F	M	F	M	F	M	F
20 to 25 Years	M	F	M	F	M	F	M	F	M	F	M	F
25 to 35 Years	M	F	M	F	M	F	M	F	M	F	M	F
35 to 45 Years	M	F	M	F	M	F	M	F	M	F	M	F
45 to 55 Years	M	F	M	F	M	F	M	F	M	F	M	F
Over 55	M	F	M	F	M	F	M	F	M	F	M	F
Unknown
TOTAL	3,166	1,585	3,166	1,585	3,166	1,585	3,166	1,585	3,166	1,585	3,166	1,585
Diseases of the Larynx.												
(1) Laryngismus stridulus.												
<i>a.</i> Bronchitis.												
<i>a.</i> Acute bronchitis.												
Europeans	..	330	275	252	220	123	139	52	54	32	26	58
Eurasians	..											
Chinese	..											
Malays	..											
Indians	..											
Others	..											
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Indians	..											
Others	..											
Europeans	..											
Eurasians	..											
Chinese	..											
Malays	..											
Indians	..											
Others	..											
Europeans	..											
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Europeans	..											
Eurasians	..											
Chinese	..											
Malays	..											
Indians	..											
Others	..											
Europeans	..											
Eurasians	..											
Chinese	..											
Malays	..											

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR 1932.

(23-D)

V. Diseases of the Respiratory System—(contd.)

Nationality.		Brought forward										Over 55			Unknown			TOTAL			Grand Totals						
		Under 3 Months					1 to 5 Years					5 to 10 Years		10 to 15 Years		15 to 20 Years		20 to 25 Years		25 to 35 Years		35 to 45 Years		45 to 55 Years			
		M	F	M	F	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Grand Totals				
102. Pleurisy (continued).	2. Other pleurisy.	445	368	520	424	288	312	81	84	40	29	68	38	192	94	591	250	694	249	756	197	412	179	...	4,087	2,224	4,087—2,224
																									1—1		
103. Congestion and hemorrhagic infarct of lung.																									0—2		
104. Gangrene of the lung.																									4—0		
105. Asthma.																									2—0		
106. Pulmonary emphysema.																									2—0		
107. Other diseases of the respiratory system.	a. Chronic interstitial pneumonia including occupational diseases of the lung.																								1—0		
	b. Diseases of the mediastinum.																								2—0		
	c. Other diseases included under 107.																								4—2		
	d. Other diseases included under 107.																								4,132—2,249		
	e. Other diseases included under 107.																								4,132	2,249	4,132—2,249
	Carried forward	446	370	520	425	288	313	81	84	40	29	68	38	192	95	594	253	700	252	775	204	428	186	...	4,132	2,249	4,132—2,249

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

(24-D)

VI. Diseases of the Digestive System.		Nationality.												Grand Totals																								
		Under 3 Months			3 to 12 Months			1 to 5 Years			5 to 10 Years			10 to 15 Years			15 to 20 Years			20 to 25 Years			25 to 35 Years			35 to 45 Years			45 to 55 Years			Over 55			Unknown			TOTAL
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F					
108. Diseases of the buccal cavity and annexa.	(1) Diseases of the teeth and gums.	Brought forward ..	446	370	520	425	288	313	81	84	40	29	68	38	192	95	594	253	700	252	775	204	428	186	...	...	4,132	2,249	4,132—2,249							
		Europeans	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		Eurasians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		Chinese	...	...	...	1	...	...	2	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	3	1	...	...	...	...			
		Malays	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...		
		Indians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	
		Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(2) Ludwigs angina.	Europeans	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Eurasians	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Chinese	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Malays	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Indians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
	(3) Other diseases included under 108.	Europeans	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Eurasians	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Chinese	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Malays	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Indians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
	109. Diseases of the pharynx and tonsils.	Europeans	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Eurasians	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Chinese	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Malays	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Indians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
	110. Diseases of the oesophagus.	Europeans	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Eurasians	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Chinese	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Malays	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Indians	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
	111. Ulcer of the stomach or duodenum.	Europeans	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	...	4	...	...	...	...	...	...	...
		Eurasians	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	...	4	...	...	...	...	...	...	...
		Chinese	...	...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	7	...	...	...	...	...	7	...	...	...	...	...	...	...
		Malays	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Indians	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...
		Others	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	...	4	...	...	...	...	...	...	...
	Carried forward ..	446	372	521	426	289	313	84	84	40	29	68	39	193	95	605	254	710	253	785	207	434	186	...	...	4,175	2,258	4,175—2,258								

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

(25-D)

(26-D)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

VI. Diseases of the Digestive System—(contd.)

VI. Diseases of the Digestive System—(contd.)												Grand Totals																				
Nationality.	Brought forward												TOTAL																			
	Under 3 Months			3 to 12 Months			1 to 5 Years			5 to 10 Years			10 to 15 Years			15 to 20 Years			20 to 25 Years			25 to 35 Years			35 to 45 Years			45 to 55 Years			Over 55	
M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F						
1118. Hernia Intestinal obstruction. (continued).	568	482	683	564	400	415	86	93	40	29	68	43	196	98	609	261	726	260	801	210	449	197	4,626	2,652	4,636-2,652				
b. Intestinal obstruction.																																
1119. Other diseases of the intestines.																																
20. Acute yellow atrophy of the liver.																																
22. Cirrhosis of the liver.																																
(b) Not returned as alcoholic.																																
23. Biliary Calculi.																																
24. Other diseases of the liver.																																
26. Peritonitis without stated cause.																																
Carried forward	571	485	685	564	400	415	86	93	41	29	69	44	200	100	632	266	755	267	829	213	465	202	4,733	2,678	4,733-2,678							

VII. Non-Venereal Diseases of the Genito-Urinary System and Annexa.

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

(28-D)

VIII. The Puerperal State—(contd.)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

(30-D)

(31-D)

X. Diseases of the Bones and Organs of Locomotion.

XI. Congenital Malformations.

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

(32-D)

XIII. Old Age.		Nationality.		Under 3 Months		3 to 12 Months		1 to 5 Years		5 to 10 Years		10 to 15 Years		Years 15 to 20		Years 20 to 25		Years 25 to 35		Years 35 to 45		Years 45 to 55		Over 55		Unknown		TOTAL		Grand Totals	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
4. Old age.	2. Other forms of senile decay.	..	889	752	719	598	411	424	92	95	45	30	76	50	205	134	656	335	791	324	903	254	567	256	...	...	6,354	3,252	5,354—3,252	
35 & 166. Suicide by solid or liquid poisons and corrosive substances.		..																													
68. Suicide by hanging or strangulation.		..																													
71. Suicide by cutting or piercing instruments.		..																													
76. Poisoning by venomous animals.		..																													
77. Other acute accidental poisoning (not by gas).		..																													
Carried forward	..	889	752	719	598	412	424	92	96	45	30	76	52	205	136	674	340	806	326	923	258	774	468	..	..	5,615	3,481	5,615—3,481		

(34-D)

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

KIV. External Causes—(contd.)

XIV. External Causes—(contd.)

XIV. External Causes—(contd.)										XV. External Causes—(contd.)																
Under 3 Months	M	F	M	F	M	F	M	F	M	15 to 20 Years	20 to 25 Years	25 to 35 Years	35 to 45 Years	45 to 55 Years	Over 55	Unknown	TOTAL	Grand Totals								
2. Hunger or thirst.	889	758	719	599	422	431	101	101	53	35	81	53	215	136	700	342	831	327	937	260	784	469	...	5,732	3,506	5,732—3,506
s. Homicide by cutting or piercing instruments.																										
9. Homicide by other means.																										
12. Other and unstated forms of accidental violence, Execution.																										
13. Violent deaths of unstated nature (i. e. accidental, suicidal &c.) and cause.																										
15. Cause of death unstated or ill-defined.																										
1. Heart failure (age 1—70).																										
2. Other ill-defined causes.																										
Carried forward ..	761	724	603	433	435	103	104	53	35	82	53	221	140	720	349	850	336	930	277	812	481	...	5,876	3,574	5,876—3,574	

MORTALITY ACCORDING TO DISEASE, NATIONALITY, AGE AND SEX FOR THE YEAR, 1932.

The following return shows the total number of deaths at different age periods in the different nationalities:—

**MORTALITY ACCORDING TO NATIONALITIES AND AGES
PERIOD FOR THE YEAR 1932.**

Nationality	Sex												TOTAL
		Under 3 months	3—12 months	1—5 years	5—10 years	10—20 years	20—25 years	25—35 years	35—45 years	45—55 years	Over 55 years	Unknown	
Europeans	M	1	—	1	—	1	1	3	11	10	10	—	38 } 46
	F	—	—	—	—	—	—	2	2	2	2	—	8 }
Eurasians	M	3	1	5	4	—	5	1	2	7	10	—	38 } 81
	F	4	4	5	—	—	3	5	6	2	14	—	43 }
Chinese	M	708	568	369	86	108	153	548	703	837	643	—	4,723 } 7,518
	F	643	476	342	93	64	92	258	252	217	357	1	2,795 }
Malays	M	135	119	37	8	12	27	53	49	52	86	—	578 } 1,074
	F	90	94	58	8	15	26	49	47	31	78	—	496 }
Indians	M	47	31	21	4	11	33	112	75	66	56	—	456 } 656
	F	22	22	27	4	10	17	31	24	19	24	—	200 }
Others	M	9	5	2	1	4	2	8	12	11	8	2	64 } 105
	F	5	7	3	—	1	3	5	5	6	6	—	41 }
Total	M	903	724	435	103	136	221	725	852	983	813	2	5,897 } 9,480
	F	764	603	435	105	90	141	350	336	277	481	1	3,583 }
Grand Total	..	1,667	1,327	870	208	226	362	1,075	1,188	1,260	1,294	3	..

GENERAL DEATH RATE.

The crude death rate was 20.12 per 1,000 of the population compared with 25.2 in 1931, and with 27.73 in 1930. Actually last year I gave a corrected death rate figure of 24.15 consequent on the addition to the population of the missing children referred to earlier in this report, so that in any comparison of the year under review with 1931, this figure of 24.15 must be taken. But even then, there is the almost incredible improvement of 4 per 1,000 on last year's figure, which itself constituted a low record for the city.

An immediate criticism which will be levelled against this figure of 20.12 is that it is calculated on too high a population, and that during the year, owing to the unprecedented and continued severity of the slump, many left the city. In support of this will be quoted the undoubtedly large number of empty houses. Despite this, however, there is a mass of evidence which, taken as a whole, is quite convincing proof that the population of Singapore is more or less stable and has been so for some time. There is no question but that the better class property is less heavily tenanted, and evidence of this was found during the counting of heads already referred to under Vital Statistics. On the other hand, there is ample evidence of tendency of the population to crowd into the poorer class of property and especially into the "Kampongs" and hutments.

Towards the end of the year action was taken against one of these insanitary "Kampongs" in the Geylang district. A census taken of the huts showed that there were 244 adults and 115 children under 12 housed there. As the Census Schedules of 18 months before are still available, I had the figures taken out from these. They show that on Census night there were 120 adults and 39 children housed in these huts. There are many such Kampongs in the Municipal area and where they are close to the centre of the town, they are dangerously overcrowded. I may say I have never seen localised overcrowding so bad as it is at present in my twenty years in Singapore.

Again the number of births in the municipal area for the year under review was in excess of the 1931 figure by 104, and though this is no proof with regard to the general population, it should be remembered that the sex ratio in Singapore is now 1 woman to 1.76 men. This rather negatives the frequently heard statement that the Chinese are returning wholesale to China with their families.

Further, the evidence from the Abattoirs and Markets, if the returns are carefully analysed, is corroborative of the fact that no great exodus did take place. Rather are the figures suggestive that the reverse took place, as there can be no doubt, I think, that during the year the main bulk of the population had not the means to buy more than bare necessities and simply had to tighten up their belts.

In the Abattoir the number of pigs slaughtered was down by only 5,500 on the 1931 figures of 226,000, but the slaughter of sheep and goats was 13,000 in excess of the total of 30,600 for 1931, while oxen were up by 2,400 on the 10,600 slaughtered in 1931.

The Market returns are perhaps not quite so convincing. Though there was quite a marked drop in the amounts of many foodstuffs, there was an increase in one or two of the more staple articles of diet, especially of fish. Of this latter, 12,250 tons passed through the markets in 1931, but the 1932 figures exceeded this by approximately 100 tons.

From this and other evidence, then, all cumulative in value, I am of opinion that there was no large drop in the population. The full effect of the slump was visible by the end of 1931 and most of the population who had to go, had already gone.

But while I am convinced that there was no marked decrease in the population, I do not seek to maintain that this low record death rate is entirely due to improved health conditions in the City. For the first time in its history, since it became a big town, I think Singapore is able to show a death rate which approximates more to a true one than has ever been recorded before. For some years now, I have been endeavouring to prove that Singapore on account of its geographical position, its hospital and other facilities, is a clearing house for the poor, the sick, and the decrepits of the surrounding country and islands, and that this has been reflected in its death rate. During the year industry up-country and in the islands was more or less at a standstill, estates and mines were on a care and maintenance basis with only skeleton labour forces, decrepits and unfits were mostly weeded out, and the drifting into Singapore of these, though still evident, was nothing to what it was in former years.

I think, therefore, I may assume that my contention has been proved and that whatever happens in the future, we shall be entitled to look on the death rate for 1932 as more representative of the standard death rate which Singapore, with its present health amenities, is entitled to expect.

One other fact in this connection is perhaps worthy of mention. When discussing the other day with that distinguished sanitarian, Dr. Heiser of the Rockefeller Institute, this low record death rate for 1932 and telling him my reasons to account for it, he mentioned a factor that, in his opinion, might contribute to the good result. He stated that he had observed, and his experience is international and world wide, that wherever a town had adopted chlorination of its water supply, no matter how bacteriologically pure that supply had been in the first instance, there had been practically an immediate improvement in the general death rate, not only in the deaths from intestinal disease but in deaths from all causes, i.e. it resulted in improved health all round. Now it is a significant fact, that, though bacteriologically pure, during recent years, more and more of the Municipal Supply has been chlorinated, and during 1932, practically the whole supply was so treated.

If Dr. Heiser's observation is a correct one, and steps are being taken to test it more closely, the possibilities are literally fascinating.

Turning now to an analysis of the main causes of death, let us see if it is possible to find out where the saving was effected or if it was in any particular direction. If the 1931 rates had been maintained, there would have been 11,357 deaths instead of the 9,480 actually recorded. Taking the chief causes of death and comparing what they actually caused with what they might have done at the 1931 rate, we have the following figures:—

		1931	1932	Presumptive	Actual	Saving
Pneumonias and Bronchitis	..	1,881	1,902	1,539	1,539	363
Tuberculosis	..	1,377	1,392	1,088	1,088	304
Infantile Convulsions	..	1,193	1,206	786	786	420
Diarrhoea and Enteritis	..	782	791	684	684	107
Diseases of Early Infancy	..	658	665	603	603	62
Beri-beri	..	651	658	509	509	149
Malaria	..	551	557	463	463	94
Dysenteries	..	432	437	382	382	55
Total	..	7,525	7,608	6,054	6,054	1,554

There was a saving, therefore, of 1,554 in these main causes of death alone, or approximately 83% of the whole saving.

Infantile Convulsions leads the way with a 35% improvement on the previous year. This was reflected in the Infantile Death Rate of 180.2 per 1,000 births which was also a low record for the City. Tuberculosis and the Pneumonias show a 22% and a 19% improvement respectively—both very welcome results. Beri-beri shows a 20% and Malaria a 19% improvement, while all the others also show appreciable savings.

On the whole, then, it is evident, that though there were big savings in certain directions, there was an improvement all round. To what extent, however, this may be attributed to an improvement in the

general health of Singapore it would be unwise to speculate, as, if on the other hand we examine a group of diseases which may be described as non preventable or at any rate not liable to be influenced by available public health methods of attack, we see little improvement. Thus Cancer caused 204 deaths in 1932 against 189 in 1931, Syphilis 200 against 193, Acute Nephritis 77 against 72, and Diabetes 47 against 39. At the same time, however, there was a big saving in the preventable group of diseases. This undoubtedly meant improved health and, provided we make due allowance for the reduction in the number of unfits from outside, I think we may assume that part at least of that improved health may be credited to Singapore itself.

That the stream of unfits to Singapore is definitely slowed down is more or less proved by the decreased killing effects of the debilitating and invaliding diseases like Tuberculosis, Beri-beri and Malaria but that there was still evidence of its influence in 1932 may be gathered from the returns for 1933 up to the time of writing. They show a 1.5 per 1,000 improvement on the rate for the corresponding period for last year.

In connection with this question of "external" deaths, I will once again, and for the last time I hope, give an analysis of the notifications of one disease which still plays a big part in invaliding in the F.M.S. and surrounding islands, namely Malaria. A total of 1,795 notifications of this disease were received during the year from the Government hospitals. These were classified as in former years according to their addresses and our knowledge of the Anopheline breeding near those addresses, as follows:—

Probable Singapore Infections	..	..	129
Possible Singapore Infections	..	..	165
Impossible Singapore Infections	..	..	695
Outside Municipal Limits	..	..	650
Insufficient addresses	..	..	156

Total	..	..	1,795

Approximately 75%, it will be seen, fall in the "Impossible" and "Outside Municipal Limits" groups. There were 463 deaths from Malaria recorded during the year. It is not assuming too much, I think, to place 75% or 347 of these deaths as "external."

Because, as is well known, I am specially interested in the freedom from Malaria of Singapore City, I may be accused of turning these figures to suit my own purposes. But really there is plenty other proof to show that Malaria is no longer a serious problem in the town area. With the exception of the Ludlowi breeding grounds in the Kallang and Geylang River basins, it is established that most of the rest of the town is Anopheline "carrier" free. Malaria, in consequence, amongst the Europeans and better class Asiatics, is negligible and though one might not hear of all the Malaria amongst the poorer classes, who live in close proximity to the Ludlowi grounds, there is little evidence to show that it is unduly rife amongst them, whereas there is some positive evidence that it is not.

During the year, in the course of an investigation into the hook-worm infestation of the Municipal labour force, when 2,000 coolies were examined, the opportunity was taken of also determining the "malarial"

state. Only one person showed the presence of malarial parasites in his peripheral blood and only 11 were found with enlarged spleen. And even in several of those, Malaria, as the cause, was definitely excluded. These coolies are housed all over the town and I think their malarial state may be taken as a criterion of that of the main mass of the permanent population.

Further Dr. Thurai, the officer in charge of the Municipal subordinate staff and labour force, in his Annual returns, reports only 63 first attacks of Malaria during the year in the coolie force of approximately 8000, and only 6 first attacks in the clerical and subordinate staff who number approximately 900. Many of the latter live in Geylang district in fairly close proximity to the Ludlowi areas.

The great reduction in the Pneumonias and Tuberculosis, which I always take together as indicative of the toll taken by our slums, from 1881 and 1377 to 1539 and 1088 respectively, is extremely gratifying. To what extent the slowing down of the influx of unfits has contributed to this desirable result, I am unable to say, but I imagine it must have had something to do with at least the fall in Tuberculosis. At any rate, there was little improvement in our slum property during the year. Indeed, as already mentioned, localised overcrowding was more in evidence than ever.

The two diseases taken together were responsible for 24.4% of all deaths against 25.9% in 1931. Beyond my usual reminder that both these diseases are preventable and the efforts to combat them must never be relaxed, I shall say no more.

INFANTILE DEATH RATE.

This was 180.2 per 1,000 live births. The lowest ever recorded previously was in 1929 when it was 197.5. In 1931, it was 204.3. This figure, being calculated on actual notification of births and deaths, is not subject to the criticism that it is based on an over estimated population, nor is it affected to any extent by influences from outside, so that, in this instance at any rate, it can be taken to mean improved health. And the credit for this must go to the work of the Infant Welfare Branch. As time goes on, the staff of this comparatively new department become more and more experienced and more alive to their responsibilities and opportunities, not only for actual treatment of the sick, but more especially for ceaseless propaganda amongst the parents, showing them not only where and how to have their sick babies treated, but how to keep those babies from even falling sick. It reflects much credit on the staff that in a year of great and increasing poverty, they were able to achieve this figure.

The total number of deaths of infants was 2,994 in 16,589 births. The corresponding figures last year were 3,369 and 16,485. The chief causes of death are tabulated below (1931 figures for comparison).

		1932	1931
Infantile Convulsions	..	655	945
Bronchitis and Pneumonia	..	674	690
Diseases of Early Infancy	..	603	658
Diarrhoea and Enteritis	..	469	497
		2,401	2,790

Though there is a reduction in the number of deaths in all four, the saving, under the cause "Convulsions" alone, is 290 or 77% of the total saving. The term covers a multitude of mal-diagnoses but it undoubtedly includes many deaths due to malnutrition, errors of diet and ignorance of the mothers generally. I think the reduction in the mortality from this cause indicates, as already stated, that the work of the staff of the Infant Welfare department is bearing increasing fruit.

For many years, I have wondered as to the real prevalence of Syphilis in Singapore and the part it plays in our mortality tables. I have read the evidence of one Venereal Disease Commission and have been a member of another Committee and I could not but be impressed by the inexact knowledge of even medical witnessess as to the true position. I have long suspected, too, that much of our infantile mortality might be due to congenital syphilis. It seemed desirable, therefore, to try to get reliable figures which might be a guide for the future. Consequently with that object in view, a beginning was made early in the year with two parallel investigations. The first was a series of serological examinations of the mothers of all children under two years who had died without being seen in life by a medical man. The assistance of the Infant Welfare department was invoked and the method followed was for one of the Health Visitors in company with the Inspecting Registrar to visit the mother at her home and explain to her what was the purpose of the proposed examination. The desire to have a live and a healthy baby is strong in these Asiatic mothers and the response to our request was granted in well over 50% of the cases. The second investigation was carried on pari passu by Dr. Crowe, Lady Medical Officer in charge of the Infant Welfare department. It consisted of an examination of the blood of mothers of live babies. In this series, not only was the blood of mothers of frankly syphilitic babies examined, but of all mothers whose babies were simply not thriving as they should, and who showed no obvious signs of the disease. All babies in this group were under one year of age.

In all cases the Wassermann reaction was controlled by a Kahn test. In the course of these serological examinations, several discrepancies and anomalies, yet to be explained, were met with. The Wassermann seems somehow and to some extent to be influenced by pregnancy and parturition. Brief reference is made to this in both Dr. Gilmour's and Dr. Crowe's reports.

The results of both series of examinations to date are, to say the least of it, surprising and even disquieting. The investigation will of course be continued over a period of years.

Early in January of this year, a total of 500 mothers had been examined in the Registrar's series. 442 of the children were under one year when they died and I will deal with this group only. 97 mothers or 21.95% showed a positive reaction.

The distribution by nationality was Chinese mothers 21.13% positive, Malay 23.01% and Indian 20.59.

The distribution of positive mothers according to the age of the child at death was as follows:—

	Still Births	0—3 Months	3—6 Months	6—9 Months	9—12 Months
Percentage ..	25.88	19.44	26.09	12.82	30.30

These latter figures are of course too small to permit of any reliable conclusions being drawn.

In Dr. Crowe's series of cases the figures, as an indication of the prevalence of Syphilis, are even more striking. As will be seen in her report 1,161 examinations were made, but these included a number of children and even husbands. Actually 930 mothers were examined. This figure includes several "Volunteers" who asked for a blood examination for some such reason as sterility or a succession of Miscarriages etc. 271 or approximately 30% of those mothers were found to have positive reactions. There were other cases where the mother was negative and the father positive, and one or two, where, though the mother was serologically negative, the children were positive. But we are not concerned with these here. The whole series is carefully analysed in Dr. Crowe's report which should be read by those interested.

The main fact with which I am concerned at the moment is that in the first series of cases, approximately 22% of the mothers were positive, and in the second series 30%. During the year only 118 deaths of infants were certified as being due to Syphilis. Of the total of 2,994 deaths of infants the Inspecting Registrars certified the deaths of 992. I have no reason to think that the certification of deaths of children seen in life by a medical man was any more exact than that of those who were not so seen. I think, therefore, basing my conclusions entirely on the Registrar's series of cases, it is not too much to assert that in one fifth of the total infantile mortality the primary cause of death is Syphilis. And the second series of cases, to my mind, only confirms this figure and may even raise it.

It may be argued, against this conclusion that a positive Wassermann in the mother does not necessarily presuppose a syphilitic child. An effort is being made to check this by serological examination of the babies of Wassermann positive mothers. So far only 27 have been so tested and 17 have been found positive. But that apart, the invariable experience in the Clinics is that, whenever anti syphilitic remedies are exhibited in the case of a baby with a Wassermann positive mother, there results an immediate improvement in that baby's condition. And the improvement is progressive if the treatment is continued.

Assuming then that 20% of the infantile mortality is due to Syphilis, it follows that this slaughter of the innocents cannot be allowed to continue indefinitely. Sooner or later, something must be done about it. Obviously the sanest, indeed the only way, is to attack it at its source —i.e. through the mothers by ante natal work, for whatever deductions may be drawn from these investigations, this one thing is certain that in the course of one year, we have found approximately 400 syphilitic women who during the next three years or probably less will add a like number of potentially syphilitic children to our already heavily infected infant population.

The problem is admittedly not an easy one. One authority holds that once a woman has been infected, no matter how thoroughly she has been treated, even if she has been pronounced cured, she is always liable to bear a syphilitic child. That sounds rather hopeless, but on the other

hand, it is certain that if an infected woman can be treated during her pregnancy, or for the major part of it, there is every chance that her child will be born free of the taint.

And there are hopeful signs that we might expect at least a measure of success in any such campaign of treatment, for, in the course of the investigation, we found several mothers, who, when the position was fully explained to them, such was their desire for a viable and a healthy child, willingly underwent long periods of treatment at Government and other institutions.

Without wishing to criticise anyone or any institution, I would like to say that, in my opinion, the matter of the treatment of these women must be entirely dissociated from all question of Social Hygiene, and what that at present stands for in Singapore. It should be regarded as entirely a medical matter. I feel that the Municipal Welfare Clinics, at the moment at any rate, are best equipped for this work. They have a trained staff of nurses of the same nationality of the bulk of the mothers, and the organisation for following up the cases. Nor should it be forgotten that even Asiatic women don't like to be labelled "V.D." There is always the "baby" to give as a reason for attendance at our Clinics.

Such an extension of our ante natal activities must of necessity be fairly costly, and perhaps this is neither the time nor the place to ask for increased expenditure. But I might suggest that if Government cared to divert some of the money at present spent under the heading of Social Hygiene, we could promise some tangible results for it.

CERTIFICATION OF DEATHS.

The following return shows the number of deaths, the causes of which were certified by Medicalmen, Inspecting Registrars and the Coroner respectively:—

	Europeans	Eurasians	Chinese	Malays	Indians	Others	Total
Medicalmen ..	38	70	5,095	329	413	79	6,024
Registrars ..	1	7	1,889	719	179	15	2,810
Coroner ..	7	4	534	26	64	11	646
Total ..	46	81	7,518	1,074	656	105	9,480

This gives a percentage of 63.5 certified by Medicalmen as against 63.6 last year. 29.6 by Registrars as against 31.6 last year and 6.8 certified by the Coroner as against 4.8 last year.

The percentages for the last 10 years have been as follows:—

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
Medicalmen ..	55.4	58.5	58.7	59.6	63.6	65.1	66.0	68.2	63.6	63.5
Registrars ..	37.3	35.0	33.9	34.1	30.1	28.9	29.1	28.4	31.6	29.6
Coroner ..	7.1	6.3	7.2	6.2	6.2	5.9	4.8	3.3	4.8	6.8

There were 16,589 Births and 9,480 Deaths registered at the Central Office. 60 Births and no Deaths were entered in the post registration book and the sum of \$281 was received in late registration fees.

Dr. Lee Lian Hoe, Inspecting Registrar, was in charge of the investigation into the Wassermann state of the mothers of children who had died unattended by medical men. I wish to record here my appreciation of the great interest he showed and for the thorough manner in which he followed up the cases.

VI & VII ANALYTICAL AND BACTERIOLOGICAL EXAMINATIONS.

Both reports are appended. As the years go on these laboratories, carry out, in addition to the usual routine public health examinations, an increasing volume of highly technical and valuable research work. It is impossible to dissect these reports, and to publish extracts from them would give no indication of the scope of the usefulness of the laboratories. The reports should be read in full. Both are couched in simple language and can be read and understood by the layman, who is interested in that side of Public Health with which the laboratories deal.

I congratulate both officers on their interesting and useful reports.

VIII ANTI MOSQUITO WORK.

Full details will be found in Dr. Dawson's report which is appended.

New Works. New Work was carried out in five outlying areas involving the cutting of 6,030 yards of main earth ditches and the laying of 17 yards of concrete channels. In existing areas, 4,670 yards of concrete channels, replacing earth ditches, were constructed and 2,911 yards of subsoil pipes were laid.

During the year, 7 gangs of 20 men each were constantly employed on maintenance, 6 were employed on new works and 2 gangs on patrol work in the Katong and Siglap areas. Of the 6 gangs employed on new work, 4 were dispensed with in July.

6 field workers were continuously engaged in routine mosquito surveys. They brought 4,934 collections of larvae to the departmental laboratory for identification.

18,682 gallons of anti malarial mixture were used during the year, mainly in the Ludlowi breeding grounds of the Kallang and Geylang Basins.

The total amount spent in all Anti Mosquito Work during the year, was \$88,276 as compared with \$128,700 in 1931. This saving is almost entirely due to the fact that the programme for new work is practically completed. It was not due to retrenchment. I make this statement as fears were expressed at the time that we might be taking an unnecessary risk in cutting down this very essential service.

It may be of interest to record that at the end of the year, 130 separate areas were under routine maintenance. Within these areas are 41.25 miles of concrete channels, 72.63 miles of subsoil pipes and 19.9 miles of main earth ditches.

Our Ludlowi problem remains in statu quo. The Improvement Trust scheme for the reclamation of the Kallang Basin is for the time being shelved on account of the financial stingency.

Our experience of this mosquito was much the same during the year as it was in 1931. Its well known carrying propensities seemed to be in abeyance. Only an occasional case of malaria was reported from the districts in which it breeds and at no time were there any signs of an epidemic.

That the mosquito was active however, outside the municipal area, may be gathered from the fact that in the early part of the year, there was a severe outbreak of malaria amongst the coolies employed on the construction of the Naval Base at Seletar. In the short space of three months, no fewer than 2,600 coolies went down with the disease. Treatment, however, was effective and thorough and the case mortality was negligible. This experience at the Base led us to give close attention to the almost similar work going on at the Civil Aerodrome in Grove Road. A close cooperation between the Engineer in charge and this department was established and maintained, and so far there has been no cause for alarm.

The more we study this particular Anopheline, the less we seem to know. I feel that very close expert study of its bionomics would amply repay us. The most recent information which I have is that the mosquito which we have always looked on as Ludlowi is not the one originally described by that name, but a variety, or it may be several varieties, of that species.

That we have a mosquito of this species which breeds freely in Singapore and which transmits malaria is certain. But why at one time it should be a facile carrier of malaria and at other times appear to be negligible in that respect, I won't pretend to explain. But what I have observed in my experience of outbreaks of malaria associated with this particular mosquito is that the phenomenon seems in some way to be associated with some change in, or disturbance of, its breeding ground. The experience at the Naval Base rather confirms this. Hence my fear, too, of the possibilities of an outbreak at the Aerodrome, and the consequent need for extra vigilance.

In connection with this observation and possibly in support of the theory, I would like to describe an incident that happened about the middle of the year. A well known practitioner suddenly had several patients go down with malaria in a district where this disease was previously unknown. The district was close to the mouth of the Rochore river and investigation revealed that Ludlowi was breeding in two situations quite near (a) in the disused tongkongs and twakows which are always to be found lying on the mud at the mouth of the river and (b) in a new reclamation on the foreshore at the Lavender Street—Beach Road corner. On the surface of this reclamation, which consisted of dredgings from the mouth of the river, Ludlowi was breeding in pools formed in inequalities of the filling. Larvae from both breeding places were sent to Prof. Gater who pronounced them to be identical. I know the tongkong breeding places have been here for years. I leave the inference to be drawn.

IX. SUPERVISION OF MIDWIVES AND INFANT WELFARE.

The report of the Lady Medical Officer is appended. Very few are aware of the extent and the scope of the work carried out at the Municipal Welfare centres. A perusal of Dr. Crowe's report will convince most not only of the increasing volume of the work, but of the great help and assistance that work must be to the Asiatic mothers. The report should

be read in full. The short analysis of the investigation into the prevalence of Syphilis is especially interesting and illuminating, and Dr. Crowe's advice as to the early necessity for a big expansion of our ante natal activities is recommended for serious consideration.

The four District Sisters paid a total of 19,173 visits. These visits are of course more particularly concerned with supervision of the work of the local midwives. The rule that all babies, whether found to be well or ill at this first visit by a sister, are handed over to the Clinic staff immediately has been found to work well. It prevents all overlapping and ensures that no child is subsequently missed. Revisits to sick mothers are of course still carried out by the District Sisters.

Of the 14,758 mothers seen by the District Sisters, 10,279 were found to be living in single rooms or huts.

3,452 mothers were unattended at birth. The fact that there are two municipal midwives attached to the Clinics whose services are free, is still somehow not properly known or appreciated. They were called to only 250 cases, though they were sent to attend a further 348 cases to give post natal assistance to either mother or baby. The total visits of the two midwives amounted to 3,695.

Free medical assistance by doctors on the panel was given in 28 cases.

During the year, 14,309 babies were taken on the Clinic registers. This figure represents 87% of the total births.

41,215 consultations were held on children brought to the Clinics, while 97,202 visits were paid in the homes. If the first visits paid by the District Sisters are included in the grand total, it will be seen that we maintained our present programme, which is to give to every child taken on the registers 10 visits, at properly spaced intervals, in its first year of life.

X. FOOD AND MARKETS.

The report of the Chief Market Inspector is appended.

As already mentioned, there was a decreased amount of many food stuffs passing through the markets, but it is significant that there was an increased amount of fish which is a staple article of diet. There was also an increase on cheaper food stuffs like bean sprouts and bean cakes.

There was a fall in revenue from the markets of 11% in 1931 but over half the loss was due to the lower prices for fish prevailing throughout the year and the consequent corresponding fall in the amount of the 5% commission on the auction sales.

The revenue from stall rents must have been adversely affected too by the number of unlicensed hawkers of food stuffs who thronged the vicinity of the markets. The campaign against them was relaxed for the time being which had the effect of making them bolder and bringing them out in greater numbers. This was the subject of much heart burning on the part of our licensed stall holders.

Just over 80 tons unsound food stuffs were seized or surrendered, and destroyed.

With the modernising of our Abattoirs and especially with the introduction of daylight slaughtering only, I felt that the rigorous examination to which all beef, mutton and pork is subjected in the Abattoirs made further expert inspection in the Public markets superfluous. Consequently during the year, the Market Staff was reorganised. It was found possible to abolish the more highly paid post of Market Keeper and to substitute for him an overseer, on a much smaller salary, whose duties are confined entirely to maintaining the cleanliness of the markets. Two exceptions were made namely in Clyde Terrace and Ellenboro Markets where the fish auctions are held. Two of the more experienced Market Keepers were retained to attend these auctions and to inspect all fish as it is landed.

The other markets are subject to surprise visits by the Chief Market Inspector and to daily visits by the Sanitary Inspector in whose district they lie.

The Sanitary Inspectors as they become more highly trained and conversant with the work, carry out an increasing number of inspections of the food stuffs sold in the many private shops.

FOOD SHOPS ETC.

Licences were issued for:—

Eating Houses	796
Coffee Shops	306
Soda Fountains etc.	59
Meat and Fish Shops	139
Bakeries	21
Cake Shops	35
Biscuit Factories	4
Aerated Water Factories	8
Milk Vendors	143

During the year, the indiscriminate hawking of food stuffs of all sorts was more in evidence than I have ever seen it. This was in part due to the slump but mostly due to the fact that while the Hawker Committee was deliberating, the campaign against hawkers was more or less a dead letter. That Committee has now presented its report and recommendations. The Commissioners have accepted them and Government has endorsed them. There is no doubt, I think, but that the recommendations if fully carried out, will in time give the much needed control over hawkers. At the same time, I wish to remind the Commissioners once again of certain facts and may I say duties. Taking the first four in the above list, 1,300 in all, they represent over \$30,000 in revenue from licence fees. They represent 1,300 houses in permanent occupation at rentals higher than the average, and consequent increased assessment. They also represent a much higher consumption of municipal water, gas and electricity than similar houses otherwise occupied. Lastly, reckoning that it takes an average of \$400 to make any premises fit for licence, we find that there is a capital of over \$500,000 sunk in this trade. Surely then these licensees are entitled to some need of protection from unfair competition. But all I ask is that no time should be lost in obtaining the necessary fresh legislation which is required to put the full recommendation of the Hawker Committee into operation and that once the campaign has begun in earnest, there shall be no weakening and no turning back.

XI. PLACES OF PUBLIC RESORT.

Theatres, Hotels, Public houses, Printing presses etc. were regularly inspected and the necessary reports made to the licensing authorities concerned.

XII. SLAUGHTER HOUSES.

During the year, 278,308 animals were slaughtered in the Municipal Abattoirs. They were as follows. The 1931 figures are given for comparison:—

		1932	1931
Pigs	.. ..	221,353	226,807
Sheep	.. ..	42,297	26,871
Goats	.. ..	1,465	3,809
Oxen	.. ..	12,958	10,599
Buffaloes	.. ..	235	298
		<hr/>	<hr/>
		278,308	268,384
		<hr/>	<hr/>

1,451 carcases were totally condemned, 1,401 of them being pigs, 39 sheep and 11 oxen. Of the pigs, 1,011 were suffering from Cysticercus Cellulosae, 193 from Swine Fever and 31 from Tuberculosis. 7 of the oxen also showed generalised Tuberculosis.

The experimental "electrothaler" for the stunning of pigs was in continuous operation throughout the year, and was a complete success. It has been decided to equip all the slaughtering pens in this Abattoir with this apparatus.

In connection with humane methods of slaughter too, it was decided to instal a "Weinberg" pen for the casting of oxen. The Mohammedan Advisory Board were very helpful in this matter and approved of the apparatus being tried. It is hoped later, with the approval of the Board, to instal an "electrothaler" for the preliminary stunning of these larger animals.

XIII. OFFENSIVE TRADES.

440 licences, 359 of them being for laundries, were issued during the year, the fees drawn being \$2,176.64.

I mentioned in my report for last year that it was my intention to raise the question of the compulsory pasteurisation of milk. A large series of examinations of milk from all sources was carried out by the Bacteriologist and the results of these, as was to be expected, amply confirmed the case for pasteurisation. At the same time, the financial position is such that nothing can be done at the moment toward the establishment of a Municipal Pasteurisation centre. And I am afraid a Municipal Centre is the only solution as most of the milk trade in Singapore is in the hands of a number of persons of no substance and with no capital.

XIV. BURIAL GROUNDS.

The number of Burials in Municipal Cemeteries was as follows:—

		1932	Since Opening
Bidadari—			
Protestant	.. .. ..	171	3,164
French Roman Catholic	.. ..	139	3,633
Portuguese Roman Catholic	.. ..	38	1,287
Pauper	.. .. ..	599	12,311

			1932	Since Opening
Serangoon Road—				
Mohammedan	..	..	1,164	9,828
Pauper	..	..	121	993
Bukit Brown—				
Chinese	..	..	504	5,846
Pauper	..	..	2,016	10,798
Hindoo Cemetery—				
Burials	..	..	299	2,155
Cremations	..	..	92	745
Paupers	..	..	99	510
Singhalese Burial Ground—				
Burials	..	..	8	8
Cremations	..	..	2	2
Paupers	..	..	1	1
Infectious Disease—				
Serangoon Road	..	..	27	711
Yeo Chu Kang Road	..	—	—	555
Total	..	—	5,210	52,547

The Burial Grounds Inspector made 1,765 inspections during the year and attended 59 exhumations.

The total number of burials inside Municipal limits was 6,752. Of these, 5,210 were in Municipal Cemeteries, the rest being in the other 19 private and 92 public cemeteries. 105 of the non-municipal cemeteries are exclusively Chinese.

XV. STAFF.

Dr. Hutchinson went on leave in March returning in October, and Mr. Benjafield, Chief Sanitary Inspector, in February returning in October.

Sanitary Inspectors A. J. Vaz and J. B. Quays were successful in obtaining the diploma of the Royal Sanitary Institute taking first and third places respectively in the examination.

HEALTH OF MUNICIPAL SUBORDINATE STAFF.

The number of cases treated was 10,732. There were 778 sent to hospital and 250 to various Clinics. 14,848 days sick leave were granted, 14,434 dressings were applied at the Dispensary where the daily attendances totalled 26,095. Private practitioners treated 398 cases, while the Medical Officer in charge paid 160 visits to patients in their homes.

During the year, an investigation was made to determine the degree of Hookworm infection in the Municipal Labour Force. This investigation was primarily to find out what, if any, were the special risks to which the sewage farm coolies were exposed. For comparison, a representative number of coolies from all departments were taken and the total number examined was 2,000.

The opportunity was also taken, as already mentioned earlier in this report, to determine the malaria state of the labour force.

The arrangements for the investigation were in the hands of Dr. Thurai, who also conducted all the physical examinations, collected and collated all the records of the cases, and I have to thank him for the very capable manner in which he carried this out.

A full report was submitted to the Commissioners at the time. I need only refer to one or two main points here.

Though the sewage farm coolies showed a 93% hookworm infection, the average infection of the whole force was 80%, so that it does not appear as if the nature of employment is relatively important. When it is remembered that the bulk of the labour is engaged on asphalt roads and uninfected ground generally and that it is housed for the most part in sanitary surroundings that preclude the risk of infection, it becomes obvious that the coolies must contract the disease elsewhere—i.e. they are infected before they join our service.

Following on my report, it was decided to treat the whole labour force of approximately 8,000 coolies. The treatment was carefully carried out, all coolies being admitted to hospital the previous evening, treated the following day, and being kept under observation in hospital for the rest of that day and night. Upwards of 2,000 had been successfully treated when there were two fatal accidents within a day or two of each other. Since then all treatment has been suspended and the question as to the conditions under which it will be resumed is still, at the moment of writing, under consideration.

XVI. GENERAL.

There were 4,241 notices including 913 intimations served during the year which, with 381 from the previous year, made a total of 4,622. Of these, 4,134 were complied with, 251 cancelled and 237 carried forward.

There were 49,628 visits of inspection paid by the Sanitary Inspectors, 2,048 prosecutions with 1,721 convictions with fines imposed amounting to \$8,391.15, while 99 prosecutions were withdrawn and 228 summonses could not be served.

The following reports and returns are appended:—

- Anti Mosquito Report.
- Report of the Analyst.
- Report of the Bacteriologist.
- Report of the Lady Medical Officer.
- Report of the Superintendent Middleton Hospital.
- Report of the Market Inspector.
- Return of Inspectors' prosecutions.
- Return of Notices.
- Return of licences for Offensive Trades.

In conclusion I should like to record my grateful appreciation of the loyal assistance which I had at all times from all members of the staff, both senior and subordinate, during a year, which, with Retrenchment and other things, was at times a little difficult.

I have the honour to be,

Sir,

Your obedient servant,

P. S. HUNTER,

M.A., M.B., Ch.B., D.P.H.,

Municipal Health Officer.

(52-D)

MUNICIPAL HEALTH DEPARTMENT,

Singapore, 15th February, 1933.

THE MUNICIPAL HEALTH OFFICER.

SIR,

I have the honour to forward the following report on anti-mosquito measures carried out in the Municipal Area during the year 1932.

ANTI-MALARIAL WORKS.

New works were carried out in the following areas:—

Area No. 123	Kampong Limau Ravine.
Area No. 126	Temple Ravine.
Area No. 127	Henderson Road West Ravine.
Area No. 130	Mount Washington Ravine.
Area No. 129	Sungei Namly Ravine (Coronation Road).

Areas Nos. 123, 126, 127 and 130.—These areas comprise the remaining undrained ravines on the northern slopes of Mount Faber and Mount Washington. The ravines, which drain to the Singapore River near Alexandra Road, were cleared of undergrowth and trees, and drained by main earth ditches. All ponds and wells were filled or drained and the ravine floors were levelled off.

Work in areas Nos. 126 and 127 was commenced in 1931 and completed during 1932. Work was completed in Area No. 123 and is still in progress in Area No. 130. 5,326 yards of earth ditches were cut, 202 trees were felled, 151 ponds drained and 7 wells were closed.

Area No. 129.—Work in this area was continued during the year and 704 yards of main earth ditching was carried out. Clearing of undergrowth was completed, 7 ponds and 3 wells were filled, and 50 feet of open concrete channel were laid under the Johore pipe line to prevent scour unearthing the pipe line foundation.

EXTENSIONS OF EXISTING WORKS.

Extensions and repairs to existing works were carried out in the following areas:—

Area No. 36 Wishart Ravine.—The replacement of the earth ditch in this ravine by a concrete anti-malarial drain was continued during the year. 578 feet of eighteen-inch concrete channels and 40 feet of twelve-inch concrete channels were laid and seepages were drained by the laying of 412 eight-inch subsoil pipes and 556 five-inch subsoil pipes.

Area No. 38 Alexandra Swamp.—58 ponds in this area were drained and filled. Clearing of undergrowth was carried out from the new bridge in Tanglin Road as far as the Municipal Boundary. A new main ditch in this area was completed by the Singapore Improvement Trust to conform with their layout.

Area No. 110 MacRitchie Reservoir Ravine.—The existing temporary earth drain throughout the whole extent of this ravine was replaced by a concrete anti-malarial drain. In all 6,428 feet of twenty-one inch concrete channels, 3,850 feet of eighteen-inch concrete channels, 768 feet of fifteen-inch concrete channels, and 77 feet of nine-inch concrete channels were laid. Seepages were drained by laying 284 eight-inch subsoil pipes, 3,482 five-inch subsoil pipes, and 2,707 four-inch subsoil pipes.

Area No. 56 Henderson Road.—The existing concrete channel in the sewage works enclosure was extended and regraded for a distance of 461 feet to the culvert across the new road. 450 feet of fifteen-inch concrete invert and 138 feet of twelve-inch concrete invert were laid. Seepages were drained by laying 200 four-inch subsoil pipes.

Area No. 109 Mount Pleasant Ravine.—The existing eighteen-inch concrete channel drain was extended for a distance of 106 feet at the head of the ravine. 200 five-inch subsoil pipes were laid to drain seepages.

Area No. 115 Alexandra Road Ravine No. 1.—A short length of earth drain in this area was replaced by a twelve-inch concrete channel drain for a distance of 350 feet, and 430 five-inch subsoil pipes were laid to drain seepages.

Area No. 53 Fort Canning.—94 four-inch subsoil pipes were laid for the draining for seepages at the toe of the hill near River Valley Road.

Area No. 15 Woodleigh.—140 four-inch subsoil pipes were laid to drain seepages on the bank behind the clear water tank.

Area No. 32 Radin Mas.—The main line of subsoil pipes in Ravine No. 5 was taken up and replaced by an open concrete channel to provide drainage for Malay houses which are being built in this area.

1,170 feet of eighteen-inch concrete channels, 54 feet of twelve-inch concrete channels and 30 five-inch subsoil pipes were laid.

Area No. 7 Gleemaird.—An area of closely planted rubber trees on swampy land adjoining Bukit Timah Road was cleared by permission from the owner. 2,645 rubber trees were felled.

MAINTENANCE.

Routine maintenance work consisting of clearing, grass cutting and minor repairs was carried out in all existing anti-malarial areas.

MOSQUITO SURVEYS.

Systematic surveys of the Municipal Area were carried out throughout the year and 4,934 collections of mosquito larvae were examined and identified in the laboratory.

GENERAL ANTI-MOSQUITO WORK.

658,998 yards of earth drains were cleared and regraded by patrol gangs and those gangs also collected and disposed of a monthly average of 1,295 large baskets of empty tins. Numerous small ponds and wells were also filled.

(54-D)

OILING.

18,682 gallons of anti-malarial mixture were used in spraying mosquito breeding places principally in the Katong Area and in the low lying areas adjacent to Grove Road, Geylang Road and Alexandra Road.

CONTROL OF DOMESTIC MOSQUITO BREEDING.

Mosquito larvae were found in 7,874 houses and compounds or roughly 15.86% of all houses visited by the Sanitary Inspectors.

209 notices were served under the Destruction of Mosquito Ordinance.

I have the honour to be,

Sir,

Your obedient servant,

W. DAWSON,

Deputy Health Officer.

Singapore Municipality

Twenty-Fifth Annual Report

of the

Municipal Chemical Laboratory

For the Year

1932

by

J. F. CLARK, M.Sc., D.I.C., A.R.C.S., F.I.C.

MUNICIPAL HEALTH OFFICE

CHEMICAL DEPARTMENT,
Singapore, 1st February, 1933.

THE MUNICIPAL HEALTH OFFICER,
SINGAPORE.

SIR,

I have the honour to submit the following report on the work carried out in the chemical laboratory during the year 1932.

The total number of samples analysed during the year was 12,999, the detailed figures of which are given in the following table.

Public Water Supply	Routine samples from Singapore	
	Island	6,436
	Routine samples from Johore ..	1,608
Sewage Purification	Samples from Sewage Purification Works, etc.	2,961
	Samples from House Installations ..	434
Foods, Drugs and Miscellaneous Samples	From Health Department	760
	From Engineering Department ..	265
	From Electrical Department ..	388
	From Water Department	95
	From Gas Department	40
	From Other Departments ..	12

The decrease in the number of samples from last year is almost entirely due to the elimination of several routine samples of water of which the analysis is now considered unnecessary. The number of samples from the public water supply has been reduced by 3,600.

MUNICIPAL WATER SUPPLY.

The sources of supply of raw water and the methods of treatment were, in general, the same as last year. The raw water was of very much the same satisfactory quality, the chief difference being a slight increase all round in the amount of iron present. Throughout the year the supplies were free from any traces of harmful contamination.

Table A, at the end of this report, gives the averages and ranges of analyses of the various sources of raw water. There is a decrease in all cases in the total solid matter present, compared with the preceding year, but this decrease is confined almost entirely to the mineral matter present, the organic matter being slightly higher than before, except in the case of water from Pontian Kechil.

For the last four months of the year, a steady increase was noted in the total solids, oxygen absorbed, and iron figures in the samples from Peirce reservoir. At the end of the year this reservoir was taken out of service for scouring and MacRitchie reservoir, which had not been in service since January, was brought into use. This had an immediate beneficial effect on the colour and iron in the filtered water.

From the 2nd of February, the Sedimentation tank at Gunong Pulai was in use. The action of this tank can be seen from the following table.

**TABLE SHOWING THE ACTION OF THE SEDIMENTATION TANK
AT GUNONG PULAI.**

(Averages of Daily Analyses During 1932).

	Raw Water	After Sedimentation Tank	Clear Water Tank
Iron (Total) ..	0.055	0.030	0.016
Carbon Dioxide ..	0.51	0.56	0.185
Alkalinity (as CaCO ₃) ..	0.59	0.29	1.20

The reduction in iron is satisfactory, and the change in alkalinity would be expected, since after aeration by spraying sulphate of alumina is added in the sedimentation tank, which reduces the alkalinity, and lime is added to the filtered water, which causes an increase. It appears that the loss of carbon dioxide on aeration is rather more than balanced by the carbon dioxide liberated by the addition of sulphate of alumina.

Table B gives the characteristics of water taken from various depths near the main dam in the Sultan Ibrahim reservoir, Johore. The water appears to be slightly more uniform than it was in the previous year, but there is still a very much higher concentration of iron as greater depths are reached than is present in the surface water.

Table C gives the averages and ranges of daily analyses of the filtered water supplied to Singapore. Once more there is an improvement in every case in the colour of the water supplied, and the average iron content is lower than the preceding year, although in most cases the fluctuation has been slightly greater.

The averages and ranges of analyses of monthly samples from the tap supply (Table D) show an even better colour and lower iron content than the previous year. The total solids are slightly increased from last year, chiefly in the organic matter, which has the effect of raising slightly the ammonia and oxygen absorbed figures.

The raw water in Johore was treated with sulphate of alumina, averaging roughly one grain per gallon in Pontian water and half a grain per gallon in Sultan Ibrahim water. Lime was added to this water after filtration at an average rate of 0.3 grains per gallon (effective concentration) and from the beginning of July chlorine was introduced in the proportion of 0.2 parts per million.

The Woodleigh filters were working up to the 29th of December and the water here was treated with 0.4 grain per gallon of lime (effective concentration) before filtration. The filtered water was chlorinated at an average rate of 0.5 parts per million throughout the year.

**SEWAGES, EFFLUENTS, ETC. FROM THE MUNICIPAL
SEWAGE WORKS.**

Throughout the year the Sewage Disposal Works at Alexandra Road treated an average volume of 3,860,000 gallons of sewage per day. This is an increase of 389,000 gallons per day on the average for 1931, and due to the greatly increased amounts of nightsoil now added, the strength of the crude sewage has been considerably higher throughout the year.

The method of treatment was on the whole, substantially the same as last year. The whole volume of the sewage was passed through the detritus and sedimentation tanks, and of resulting effluent, 79.25% was further treated in the percolating filter beds and the remaining 20.75% partially purified in the bio-flocculation unit. The effluent from this unit, apart from a small proportion which was passed through a small experimental filter bed, was allowed to mix with the effluent from a section of the large filter beds (blocks A, B and E).

Tables E and F, attached to this report, give the averages and ranges of daily analyses of samples taken from various points in the purification system.

Crude Sewage. As stated above, the total volume of crude sewage was both larger in volume and stronger in character than the previous year. The only value which showed a reduction was the chloride figure, indicating a smaller degree of seawater infiltration. Thus the increase of actual sewage treated was probably even larger than the above figures indicate.

The solids in suspension in the crude sewage contained 87.4 per cent of organic matter, and the reaction of the sewage was practically neutral (average Ph. 6.9).

Detritus Tanks. Taking an average over the whole year, these tanks abstracted 12.2 per cent of the suspended solids in the crude sewage. From the middle of October, arrangements were made to give a steadier flow through the tanks. During the night the small centre tank was used for the period of low flow, and the larger side tanks used during the day. The effect on the settlement of solids of the steadily increasing amounts of nightsoil can be seen from the following table.

**TABLE SHOWING THE ACTION OF THE DETRITUS AND
SEDIMENTATION TANKS.**

Month	Percentage reduction of suspended solids		
	In Detritus Tank	In Sedimentation Tank	Total
January ..	5.3	51.5	56.8
February ..	5.8	52.4	58.2
March ..	4.9	55.2	60.1
April ..	3.4	52.8	56.2
May ..	9.2	47.7	56.9
June ..	12.5	42.1	54.6
July ..	16.8	36.2	53.0
August ..	18.8	30.2	49.0
September ..	20.7	28.2	48.9
October ..	20.4	28.9	49.3
November ..	15.3	39.7	55.0
December ..	12.7	43.2	55.9

From March onwards, the total proportion of solids extracted was steadily falling whilst the proportion extracted by the Detritus tanks was rising, as the amount of nightsoil increased. More and more organic matter was being deposited in the Detritus Tanks, with consequent less effective action of the Sedimentation tanks. From the time of alteration of the flow, in the Detritus tank, the proportions have gradually been approaching a much more normal figure for the local type of sewage.

Sedimentation Tanks. These tanks extracted 42.3 per cent of the total suspended matter in the crude sewage, and ratio of organic to inorganic matter in the solids in these tanks was reduced from 5.4 to 1 before digestion to 2.04 to 1 after digestion. These figures, although not quite up the same standard as last year, must however be classed as satisfactory in view of the conditions of working throughout the year.

Filter Beds. It is very pleasing to note that in spite of the increased strength of sewage, the final effluent from the filter beds shows a pronounced improvement, compared with the figures for last year. As mentioned in the last report, the beds are now washed with a strong jet of humus tanks' effluent, and the improvement then noticed has been well maintained throughout the year.

As before, the addition of effluent from the bio-flocculation unit to the effluent from the beds in blocks A and B renders this rather poorer in quality than that from blocks C and D. Arrangements have now been made to treat the whole of the bio-flocculation unit effluent on larger filter beds, so that in future a uniformly excellent effluent, similar to that from blocks C and D should be produced.

SPECIAL INVESTIGATIONS RELATING TO SEWAGE PURIFICATION.

1. Bio-flocculation treatment of Sedimentation Tanks Effluent.

The bio-flocculation unit has been worked throughout the year, with the exception of a few days stoppage for repairs, and has treated a daily average of 838,000 gallons of effluent from the Sedimentation tanks, that is, about 20% of the total flow. Previous experience has shown that complete purification cannot be obtained with this unit, but the effluent can be filtered on percolating filter beds at a very much higher rate than the Sedimentation tanks effluent, so that using this as a method of partial purification, a much smaller number of filter beds would be required.

Tests during the year have been concerned with the most efficient method of working this unit. From January to June, the proportion of activated sludge added to the incoming liquor was 1.6%. In June this was raised to 2.0% and in September to 3.0%. The following table gives the results of working during the three periods.

TABLE SHOWING THE WORKING OF THE BIO-FLOCCULATION UNIT DURING 1932.

Parts per 100,000	AMMONIA		Oxygen absorbed in 4 hours	Suspended Matter
	Free	Albuminoid		
January to May.				
Sedimentation tanks effluent	4.7	0.76	6.77	17.1
Bio-Flocculation effluent	4.9	0.56	4.09	7.3
% Purification	—	26	40	57
June to August.				
Sedimentation tanks effluent	4.8	0.87	7.73	18.5
Bio-Flocculation effluent	5.0	0.47	3.53	4.6
% Purification	—	46	55	75
September to December.				
Sedimentation tanks effluent	5.5	0.94	7.97	19.7
Bio-Flocculation effluent	5.7	0.57	3.85	6.0
% Purification	—	39	52	70

It will be noticed from these results that the increase in the proportion of activated sludge from 1.6% to 2.0% was followed by a very pronounced improvement in the effluent. On raising the amount to 3.0% there was no further improvement, the percentage purification being slightly lower than before. It thus appears that the optimum proportion of sludge is in the neighbourhood of 2.0%, although, of course, the sewage treated was much stronger in the latter part of the year.

The small experimental filter bed was worked throughout the year, treating a portion of the bio-flocculation unit effluent. In March the rate of flow was increased from 10 gallons per cubic yard per hour to 13 1/3 gallons, and the working day reduced from 16 hours to 12, so that the filter treated the same volume with a longer rest. In June the working period was extended to 18 hours with six hours rest, with no change in the rate of flow. Throughout these changes, a uniformly excellent effluent was obtained, and no ponding of the bed took place, showing that with this bed a very greatly increased rate of flow was possible and less attention was required than with the large beds treating Sedimentation Tanks effluent direct.

Arrangements were completed at the end of the year to treat the bio-flocculation effluent on three large new filter beds, to see if the result of the small experimental bed could be obtained on a large scale. If this is possible it will mean that a partial treatment could be given by the bio-flocculation process, and a considerably reduced number of filter beds would be required to treat the effluent. These beds would also need less attention than is called for under present conditions of working.

2. Further digestion of Sedimentation Tanks' sludge.

The sludge from the Imhoff tanks treating the local sewage is very bulky and wet in character, and the ratio of organic to inorganic matter is relatively high. That this is partly due to the dumping of nightsoil in

(60-D)

the sewage is evidenced by the following table, giving comparative analyses of sludge from the sedimentation tanks at Alexandra road and sludge from tanks of the same design in five private house installations, treating waterborne sewage only.

		Average value Alexandra Road	Average values Private Installations
Moisture	..	95.53%	92.82%
Organic matter	..	2.94%	4.25%
Inorganic matter	..	1.53%	2.93%
Ration	Organic Inorganic	1.92	1.45

This shows that the sludge from the water-borne sewage is considerably drier, and consequently less bulky, and the digestion is more complete than is the case with the Imhoff tank sludge at Alexandra Road. It is of interest in this connection to note that if a sludge containing 95.53 per cent of moisture were dried until it contained 92.82%, the bulk would be reduced by nearly 40%.

An attempt has been made this year to digest the sedimentation tanks' sludge more completely by setting aside a special tank for its further digestion. Sludge is added to this, the top liquid drawn off, and the resulting "secondary" sludge drawn off from the bottom at regular intervals. This experiment was commenced at the beginning of the year, and after six months appeared to have settled down to regular operation. The results for the second half of the year were as follows.

Table showing the effect of Secondary Digestion of Sludge.

		Sludge added to Secondary Tank	Sludge drawn from Secondary Tank
Moisture	..	95.74	95.37
Organic Matter	..	2.86	3.04
Inorganic Matter	..	1.40	1.59
Ratio	Organic Inorganic	2.04	1.91

These results, showing a reduction in bulk of 8.0% and a reduction in organic matter of 6.4% demonstrate that secondary digestion is taking place, but not to the extent anticipated. At the end of the year a tank with a stirrer as an aid to the digestion was nearing completion, and this should be in operation early in the new year. If this is successful, as appears exceedingly probable from this preliminary experiment, the sludge obtained will be considerably less bulky, with consequent saving in cost of handling, and more innocuous in character, having a much reduced proportion of organic matter.

3. Treatment of Crude Nightsoil in Digestion Tanks.

As mentioned in last year's annual report, it was demonstrated that the addition of nightsoil to water-borne sewage had a very adverse effect on the settlement of the sewage. This is also shown in the comparative analyses of sludges from water-borne and mixed sewage, tabulated with reference to the further digestion of sedimentation tanks sludge.

It is obvious that if a separate method of treating nightsoil were evolved, instead of dealing with the mixture of nightsoil and water-borne sewage at Alexandra Road, the plant would work much more satisfactorily. For this reason, further efforts are being made to effect a separate treatment of nightsoil.

The experiment with six small tanks, working as primary and secondary digestion tanks, mentioned in last year's report, was continued to the end of June, and the results obtained were substantially the same in character as before. As this method of treatment was considered very promising, a test on a much larger scale, using a large sedimentation tank, was commenced at the beginning of May. From the middle of November a secondary digestion tank was brought into service, treating the sludge from the primary tank. The average results were as follows.

Table showing the effect of separate digestion of nightsoil.

		Nightsoil as added (approximate)	Sludge from Primary Tank	Sludge from Secondary Tank
Moisture	.. ..	96.13%	96.42%	94.85%
Organic matter	.. ..	3.46%	2.80%	3.76%
Inorganic matter	.. ..	0.41%	0.78%	1.39%
Ratio $\frac{\text{Organic}}{\text{Inorganic}}$	.. ..	8.5	3.6	2.7
Reduction of Organic matter ..		—	57%	68%

In each case, the tank was "seeded" with sedimentation tanks' sludge so that digestion would commence immediately. For this reason, the results from the secondary digestion tank are not yet typical, as the tank has only been working for a short period, and it is probable that there is still a considerable proportion of Imhoff tanks' sludge in the sample analysed.

There appear to be considerable possibilities in this system of handling nightsoil, since by separate digestion a fairly completely digested sludge can be obtained, and the top liquor from the digestion tanks can be mixed with the water-borne sewage without interfering with its treatment to anything like the same extent as the crude nightsoil.

4. Purification of Sewage by dilution with seawater.

(With reference to disposal of sewage at sea).

Several tests were carried out, in conjunction with the Municipal Bacteriologist, on the effect of dilution of sewage with seawater. The mixtures were placed in tanks, dilutions ranging from 1 in 10 to 1 in 100 being used. In some cases the liquid was left quiescent and in others it was agitated by stirring. Samples were taken every hour and the amount of oxygen left in the water and the bacterial count determined.

A rather striking point came to light in this series of tests. For a period of six or seven hours, none of the oxygen dissolved in the water was utilised by the sewage, and then the oxygen fell rapidly and the bacterial count increased enormously. This was the case independent of whether the solution was stirred or not. The only difference made by the dilution was that in the case of the higher dilutions the loss of oxygen was more

gradual and less complete. This seems to indicate that it takes a period of six or seven hours for the sewage to reach a state in which oxidation can take place. The state is possibly one of mechanical or bacterial disintegration, or perhaps an acclimatisation of the flora of sewage to the new conditions.

At this stage of the investigations, it would seem necessary in the disposal of a large volume of the local sewage at sea, to select a point of discharge where the flow of seawater would carry the sewage away from land for at least six or seven hours. Otherwise the sewage might be carried ashore in a very early state of digestion, with a consequent possibility of nuisance on the foreshore. This opinion may of course be modified by further experience. The immediate dilution obtained at sea is very great, but in the local waters practically the same body of water moves to and fro with the tides, and the continual addition of a large volume of sewage at one point might result in quite a high concentration being reached before purification is effected.

SEWAGE EFFLUENTS FROM HOUSE INSTALLATIONS.

Regular samples were analysed from 101 installations of which three were demolished and five were brought into operation during the year. The great majority of the tanks were desludged and samples of filter bed effluent examined three times each over this period.

Thirty-seven of these installations were maintained by the Municipal Commissioners and the rest by private individuals or firms. The following table gives a comparison of the effluents from these installations.

Parts per 100,000	AMMONIA		Oxygen absorbed	Suspended matter	Chlorides	Nitrates
	Free	Albuminoid				
Maintained by M.C.S. . .	0.60	0.09	0.89	2.53	3.60	2.31
Maintained privately . .	0.79	0.10	1.09	3.82	3.52	1.85

This table shows that the effluents from the Municipally maintained installations are definitely better than from those maintained privately. This is due to the fact that, although many of the privately maintained installations are carefully looked after, a great number apparently receive no attention whatever. But for the action of the Municipality, in periodically desludging all tanks, the results from these installations would probably be far worse than at present. The new legislation, by which the Municipality is empowered to take over the maintenance of any installation, should effect an improvement in this matter.

The tank which was last year altered to the two-storey Imhoff type has continued to give excellent results. This alteration having proved successful with a large tank (2,000 gallons) it was decided to alter a small tank (500 gallons) to see if the same improvement could be obtained. This alteration was carried out in August, but owing to slight defects in the tank, it has so far been impossible to obtain representative samples for comparison purposes.

Complaints of smell from filter beds have led to a few beds being completely covered in, and the results have been entirely satisfactory. The oxidation and nitrification of the sewage have been apparently unaffected, and the complaints of smell from these beds have ceased.

SAMPLES FROM THE HEALTH DEPARTMENT.

The samples were received from various officers of the Department and include many unofficial samples brought by the Sanitary Inspectors and members of the laboratory staff.

The samples analysed were as follows.

1. Milk and milk products.

Fresh milk from itinerant vendors, dairies and retail shops (238) Reconstituted milk (48), Tinned natural milk (10), Sweetened condensed milk (77), Unsweetened condensed milk (39), Human milk (2), Reconstituted cream (4), Cheese (1).

2. Water, alcoholic liquors, etc.

Well waters (94), Water for salinity tests (15), Soda water from factories and small fountains (121), Fruit juice and syrup (3), Samsoo (2), Beer (1).

3. Miscellaneous.

Tinned green peas (15), Tinned bean curds (9), Coffee (3), Bread (2), Flour (8), Margarine (2), Spices (10), Vinegar (8), Face powder (32), Earthen-ware (2), Urine (5), Sheep's stomach (1), Dog's stomach (1), Mustard oil (1).

4. Drugs.

Aspirin (2), Phenacetin (2), Chenopodium oil (2).

Milk from itinerant Vendors and Dairies.

The results of analyses carried out during the year are summarised in the following table:—

	Samples from Licensed Vendors	Samples from Unlicensed Vendors
Number of analyses carried out	176	16
Deficiency in non-fatty solids	Number 49 Percent 27.8 Range 1.2% to 38.8% Average 12.2%	10 66.7 5.3% to 39.4% 16.4%
Deficiency in fat	Number 3 Percent 1.7 Range 1.5% to 49.2% Average 22.0%	2 13.3 4.6% to 12.3% 8.4%

It would be unfair to draw any conclusions from these results, as many of the samples were taken under the supervision of an inspector in dairies, so that watering of the milk was impossible. Thus the amount of adulteration by the vendors is greater than is indicated by these results.

The fresh cows' milk from retail shops was up to standard throughout the year except on one occasion when there was a slight deficiency in fat, and the firm concerned was notified. All the samples of reconstituted milk conformed to the Regulations.

Tinned milk.

The samples of condensed milk were examined as a check on the dilution factor which is required to be printed on the tin. All were found satisfactory, apart from a few minor points in the labelling of the tins. In these cases, the firms concerned were notified.

The samples of cream conformed to the Regulations, but the sample of cheese was deficient in fat. This cheese was not placed on the market.

Soda water, etc.

Regular samples of soda-water from factories and small fountains were found to be quite satisfactory throughout the year, apart from one or two samples from small fountains in which the amount of lead present was rather high, due to the use of lead or excessive solder in the construction of the machines. Licences for these machines were held up until satisfactory alterations had been made. The fruit juice and beer were satisfactory, but the samsoo contained a trace of lead. On enquiry, it was found that the plant had been closed down some time ago.

Of the 94 well waters examined, 83 were contaminated with sewage matter, and were condemned.

The tinned bean curds were satisfactory, but several samples of tinned peas contained copper. Seven samples were of European or Australian origin, and in two of these copper was found to the extent of 0.27 and 0.13 grains per pound in the solid portion, calculated as the crystalline sulphate. The other eight samples, of Chinese manufacture, all contained copper, in amounts ranging from 0.33 to 5.74 (average 4.03) grains per pound in the solid portion, calculated as crystalline sulphate.

The samples of Chinese face powder examined were much more satisfactory than those analysed the previous year. Of the thirty-two samples, only one was seriously contaminated with lead.

The sheep's and dog's stomachs were examined at the request of the Superintendent of Abattoirs and the Municipal Veterinary Surgeon respectively, but no substances of a poisonous nature were found. The other samples classed as "miscellaneous" were satisfactory, with the exception of one of the samples of vinegar, which bore a misleading label.

Of the samples of drugs, one of the samples of aspirin contained an appreciable amount of free salicylic acid, but the rest were all satisfactory.

The following substances were analysed and reported on:—

SAMPLES FROM ENGINEERING DEPARTMENT.

Coal	..	..	..	..	..	..	24
Sand	..	..	..	..	..	..	1
Sewage for seawater infiltration	..	..	..	..	..	..	213
Stone dust	..	..	..	..	..	..	1
Road filling material	..	..	..	..	..	..	3
Concrete	..	..	..	..	..	..	1
Glazed-ware pipes for absorption test	..	..	..	..	..	..	20
Calcium chloride	..	..	..	..	..	..	1
Timber for density	..	..	..	..	..	..	1

SAMPLES FROM ELECTRICAL DEPARTMENT.

Coal	..	..	..	..	..	..	376
Corroded lead cable	..	..	..	..	..	..	6
Methylated spirit	..	..	..	..	..	..	1
Kerosene	..	..	..	..	..	..	1
Water	..	..	..	..	..	..	1
White ant compound	..	..	..	..	..	..	1
Boiler ash	..	..	..	..	..	..	1
Boiler scale	..	..	..	..	..	..	1

SAMPLES FROM WATER DEPARTMENT.

Coal	..	..	..	..	..	21
Water from Woodleigh-Kallang concrete pipe					..	24
Various waters for contamination	..				..	17
Lime for calcium oxide content	..				..	20
Fuel oil	..	..	..	..	..	1
Potash alum	..	..	..	..	..	1
Aluminium sulphate	..	..	..	..	..	1
Sludge from tanks	..	..	..	..	..	2
Fertilisers, etc. for catchment areas					..	8

SAMPLES FROM GAS DEPARTMENT.

Coal	..	..	..	..	..	5
Coke	..	..	..	..	..	4
Spent oxide for moisture and sulphur				..	..	10
Coal tar	..	..	..	..	..	6
Flue gas	..	..	..	..	..	13

Various samples of coal gas were also analysed, samples being taken from the town supply and from the Gas Works, and reported to the Gas Engineer.

VARIOUS.

Two samples of plaster, one of concrete and one of sediment from washing coral were reported on to the Improvement Trust. Four samples of coke were tested for the Stores and Workshops, one chemical for the Fire Brigade, one fuel oil for the Chief Resident Engineer, Johore, one urine for the Prevention of Cruelties to Animals Department, and one deodorant for the Town Cleansing Department.

STAFF.

The Municipal Analyst, Mr. R. E. Willgress, departed for Europe on vacation leave in September, since when the writer has been in charge of the laboratory.

I have pleasure in recording my thanks to the laboratory staff for their loyal and willing co-operation with Mr. Willgress and myself in routine and research analyses throughout the year.

I have the honour to be,

Sir,

Your obedient servant,

J. F. CLARK,
M.S.C., D.I.C., A.R.C.S., F.I.C.
Acting Municipal Analyst.

TABLE A.

Averages and Ranges of Monthly Analyses of Singapore and Johore Raw Waters for 1932.

Parts per 100,000	MacRitchie Reservoir		Peirce Reservoir		Sultan Ibrahim Reservoir		Pulai III Catchment		Pontian Kechil Reservoir	
	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
(66-D)										
Total solids dried at 180°C	2.03 / 3.92	2.80	2.04 / 4.92	3.07	3.20 / 5.12	3.85	3.08 / 4.44	3.55	5.68 / 8.40	6.70
Organic matter	.. 1.08 / 2.44	1.80	1.24 / 3.40	1.87	1.20 / 2.24	1.71	0.84 / 2.32	1.40	2.08 / 4.52	3.59
Mineral matter	.. 0.40 / 2.16	1.00	0.68 / 2.52	1.20	1.12 / 3.60	2.14	1.44 / 2.88	2.15	2.28 / 4.00	3.11
Total solids in suspension ..	— 0.56	—	0.52	—	—	0.18	—	0.32	—	0.08
Free and Saline Ammonia .	Absent/0.008	0.003	Absent/0.004	0.0025	Absent/0.048	0.015	Absent/0.005	0.003	Absent/0.008	0.004
Albuminoid Ammonia ..	0.003/0.020	0.009	0.002/0.022	0.008	0.004/0.013	0.0075	0.001/0.006	0.0045	0.0015/0.020	0.010
Nitrites as Nitrogen ..	—	Absent	—	Absent	—	Absent	Absent/Trace	—	Absent	Absent
Nitrates as Nitrogen ..	Trace/0.001	0.0001	Trace/0.0016	0.0002	Trace/0.0017	Trace	Trace/0.0088	0.0016	Trace/0.0036	0.0005
Oxygen absorbed in 3 mins.	0.015/0.057	0.030	0.010/0.077	0.038	0.017/0.092	0.037	0.013/0.049	0.030	0.056/0.092	0.071
Oxygen absorbed in 4 hours	0.064/0.153	0.097	0.089/0.249	0.126	0.085/0.136	0.102	0.061/0.129	0.091	0.126/0.316	0.241
Chlorides as Chlorine ..	0.1 / 0.2	0.11	0.1 / 0.2	0.11	0.1 / 0.3	0.14	0.1 / 0.2	0.14	0.1 / 0.8	0.2
Iron 1. Total ..	0.03 / 0.11	0.065	0.045/0.10	0.07	0.02 / 0.64	0.095	0.030/0.060	0.045	0.01 / 0.11	0.056
2. In solution ..	Absent/0.07	0.027	0.015/0.055	0.038	—	—	0.010/0.050	0.031	Absent/0.055	0.032
3. In suspension ..	0.01 / 0.07	0.038	0.015/0.060	0.032	—	—	0.005/0.025	0.014	0.01 / 0.035	0.024
Reaction—P.H. Value ..	6.8 / 7.6	7.2	6.8 / 7.6	7.2	7.0 / 7.6	7.2	7.0 / 7.5	7.2	7.0 / 7.6	7.2
Alkalinity as (CaCO ₃) ..	0.1 / 0.4	0.23	0.1 / 0.5	0.3	0.40 / 1.1	0.66	0.2 / 0.6	0.46	1.8 / 3.4	2.5
Carbon Dioxide ..	0.1 / 0.5	0.28	alk/0.3	0.22	0.25 / 0.60	0.40	0.2 / 0.8	0.39	0.25 / 0.45	0.31

TABLE B.

Averages and Ranges of Analyses carried out bi-monthly during 1932 of depth samples
in Sultan Ibrahim Reservoir (Johore).

Depths below Surface	Iron			CO ₂			Alkalinity as CaCO ₃			Reaction:— PH value		
	Range		Average	Range		Average	Range		Average	Range		Average
	Range	Average	Range	Average	Range	Average	Range	Average	Range	Range	Average	Range
10 feet	0.01 / 0.35	0.057	alk / 0.60	0.25	0.30 / 4.90	0.77	6.9 / 8.2	7.3	7.3	7.3
20 feet	0.01 / 0.50	0.061	0.30 / 0.85	0.61	0.50 / 1.00	0.70	6.9 / 7.8	7.2	7.2	7.2
30 feet	0.03 / 0.45	0.133	0.40 / 1.70	0.92	0.40 / 1.70	0.85	6.8 / 7.8	7.2	7.2	7.2
40 feet	0.055 / 0.80	0.235	0.60 / 2.00	1.07	0.40 / 2.00	1.00	6.8 / 7.8	7.2	7.2	7.2
50 feet	0.10 / 0.90	0.323	0.80 / 2.60	1.28	0.70 / 1.50	1.10	6.8 / 7.8	7.1	7.1	7.1
60 feet	0.10 / 1.00	0.390	0.55 / 2.40	1.39	0.70 / 1.90	1.20	6.8 / 7.8	7.1	7.1	7.1
70 feet	0.13 / 1.00	0.482	0.40 / 2.60	1.49	0.90 / 2.20	1.30	6.8 / 7.8	7.1	7.1	7.1
80 feet	0.20 / 2.70	0.730	0.75 / 2.60	1.48	0.80 / 2.00	1.25	6.8 / 7.8	7.1	7.1	7.1

(67-D)

TABLE C.
Averages and Ranges of Analyses carried out daily during 1932, of the Filtered Water, etc., supplied to Singapore.

(68-D)

Parts per 100,000.		Woodleigh Clear Water Tank		Pulai (Johore) Clear Water Tank		Lorong Lalat Tap Supply		Coleman Street, Tap Supply		Havelock Road Tap Supply	
		Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
COLOUR IN LOVIBOND 2 FOOT TINTOMETER:											
Yellow	..	0.40 /3.20	0.87	0.60 /4.00	1.10	0.50 /3.20	0.89	0.7 /1.2	0.84	0.60 /2.00	0.95
Red	..	0.10 /0.80	0.11	0.10 /1.00	0.12	0.10 /0.50	0.11	0.1 /0.1	0.10	0.10 /0.40	0.11
Blue	..	0.10 /1.00	0.56	0.10 /1.00	0.40	0.10 /0.90	0.61	0.1 /1.0	0.64	0.10 /0.80	0.47
Iron	..	0.005/0.070	0.015	0.005/0.040	0.016	0.005/0.070	0.017	0.005/0.055	0.017	0.005/0.055	0.016
Alkalinity as (CaCO ₃)	..	0.50 /1.60	0.96	0.50 /1.80	1.20	0.70 /1.50	1.14	0.7 /1.3	1.11	0.7 /1.8	1.22
Carbon Dioxide	..	0.15 /0.50	0.32	alk/0.60	0.185	—	—	—	—	—	—
Reaction—P. H. Value	..	6.8 /7.6	7.2	6.90/7.80	7.27	—	—	—	—	6.8 /7.7	7.3

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TABLE D.

Averages and Ranges of Monthly Analyses during 1932 of
Singapore Tap Supply.

Parts per 100,000	HAVELOCK ROAD Tap Supply		COLEMAN STREET Tap Supply	
	Ranges	Average	Ranges	Average
Total Solids dried at 180°C ..	2.48 /4.96	3.89	2.48 /3.92	3.18
Organic matter	1.20 /2.04	1.68	1.20 /1.84	1.54
Mineral matter	1.12 /3.42	2.21	1.12 /2.32	1.64
Total solids in suspension ..	—	0.06	—	0.16
Free and Saline Ammonia ..	Absent/0.016	0.005	Absent/0.004	0.0026
Albuminoid Ammonia ..	0.001/0.010	0.007	0.001/0.016	0.0056
Nitrites as Nitrogen	Absent/Absent	Absent	Absent/Absent	Absent
Nitrates as Nitrogen	Trace/0.017	0.0053	Trace/0.0017	0.0002
Oxygen absorbed in 3 minutes ..	0.007/0.034	0.018	0.005/0.022	0.011
Oxygen absorbed in 4 hours ..	0.033/0.099	0.055	0.028/0.058	0.041
Chlorides as Chlorine	0.1 /0.2	0.12	0.1 /0.2	0.12
Iron 1. Total	0.01 /0.025	0.017	0.01 /0.035	0.016
2. In solution	—	—	—	—
3. In suspension	—	—	—	—
Reaction—P. H. Value ..	6.9 /7.6	7.3	6.9 /7.6	7.2
Alkalinity as (CaCO ₃) ..	0.9 /1.9	1.3	0.8 /1.3	1.1
Carbon Dioxide	0.2 /0.3	0.24	0.15 /0.3	0.24
Colour in Lovibond 2 ft. Tintometer:				
Yellow	0.8 /3.0	1.2	0.7 /1.0	0.9
Red	0.1 /0.4	0.12	0.1 /0.1	0.1
Blue	0.1 /0.8	0.4	0.1 /0.8	0.5

TABLE E.
Average of Daily Analyses of Crude Sewage and Effluents from Alexandra Road Sewage Works during 1932.

Parts per 100,000	AMMONIA		Oxygen absorbed in 4 hours	Suspended Matter	Nitrates as Nitrogen	Chlorides as Chlorine	Dissolved Oxygen absorbed in 3 days	P. H. Value
	Free	Albuminoid						
Crude Sewage .. .	4.4	1.2	11.78	40.2	—	48	—	6.9
Detritus Tank Effluent ..	—	—	—	35.3	—	—	—	—
Imhoff Tanks' Effluent ..	5.0	0.9	7.41	18.3	—	52	—	—
Effluent Experimental Filter Bed	0.80	0.11	1.32	0.9	2.0	55	0.60	—
Humus Tanks' Effluent:								
(1) From Blocks A, B and E	1.43	0.14	1.59	1.3	1.6	57	1.29	—
(2) From Blocks C and D ..	0.54	0.09	1.10	0.6	1.3	56	0.57	—
Bio-Flocculation Effluent ..	5.2	0.5	3.87	6.2	—	55	8.79	7.2

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TABLE F.
Ranges of Daily Analyses of Crude Sewage and Effluents from Alexandra Road Sewage Works during 1932.

Parts per 100,000	AMMONIA		Oxygen absorbed in 4 hours	Suspended Matter	Nitrates as Nitrogen	Chlorides as Chlorine	Dissolved Oxygen absorbed in 3 days	P. H. Value
	Free	Albuminoid						
Crude Sewage .. .	1.9 / 7.0	0.3 / 2.6	4.26/20.56	14.5/63.0	—	20/180	—	6.7/7.2
Detritus Tank Effluent ..	—	—	—	12.5/54.0	—	—	—	—
Imhoff Tanks' Effluent ..	1.9 / 7.2	0.2 / 1.6	3.43/10.37	9.3/30.6	—	27/152	—	—
Effluent Experimental Filter Bed	0.20/2.60	0.04/0.24	0.80 / 2.18	0.5 / 3.1	1.0/5.0	27/168	0.30 / 1.15	—
Humus Tanks' Effluent:								
(1) From Blocks A, B and E	0.30/2.60	0.04/0.32	1.01 / 2.68	0.5 / 2.9	0.3/3.3	30/107	0.26 / 2.15	—
(2) From Blocks C and D ..	0.30/0.94	0.02/0.18	0.81 / 2.38	0.5 / 1.6	0.7/2.2	21/107	0.26 / 3.26	—
Bio-Flocculation Effluent ..	2.5 / 7.6	0.2 / 1.2	1.81 / 5.41	2.4 / 9.7	—	28/138	6.00 / 13.15	7.1 / 7.4

Singapore Municipality

Twentieth Annual Report

of the

**Municipal Bacteriological
Laboratory**

For the Year

1932

by

COLIN C. B. GILMOUR, M.A., M.B., Ch.B.

(71-D)

BACTERIOLOGICAL LABORATORY,

Singapore, 22nd February, 1933.

THE MUNICIPAL HEALTH OFFICER,
SINGAPORE.

SIR,

I have the honour to report on the work done in this department during the year 1932.

I. PUBLIC HEALTH EXAMINATIONS.

Twenty-three thousand, two hundred and forty-three specimens were received, involving 30,503 examinations as compared with 27,438 examinations last year. This is again a record for the laboratory.

MALARIA.

Four thousand and sixty-three blood films were received, nearly 1,000 less than last year. Malaria parasites were found in 441, or 10.7 per cent. practically the same percentage as last year. There were 170 subtertian infections, 262 benign tertian, 5 quartan, and 4 mixed subtertian and benign tertian. Johore Water Works furnished 69 positive films, the Health Office 163, and practitioners 209.

TUBERCULOSIS.

Human Specimens.—919 specimens of sputum, 3 of faeces, 8 of urine, 1 of pus, and 9 of pathological exudates were examined. The tubercle bacillus was demonstrated in 227 specimens of sputum and 2 of faeces.

Animal Specimens (Swine).—6 glands, 5 lungs, 3 livers, 4 spleens, 2 kidneys, 1 pleura, 1 lymph were examined and tubercle bacilli were demonstrated in 4 glands, 3 lungs, 1 liver, 2 spleens, 1 kidney and in the pleura and lymph.

The diagnosis was confirmed in two cases by inoculation of guinea pigs, in which generalized tuberculosis was produced.

Animal Specimens (Oxen).—3 glands, 4 lungs, 2 livers, 1 spleen and 1 specimen of pleura were examined. Tubercle bacilli were found in all except the spleen. In one case the glandular substance was injected into a guinea pig and produced tuberculosis.

Milk.—45 specimens of milk were examined. In 10 of these acid fast bacilli were found but all of them when injected into guinea pigs failed to produce Tuberculosis. In no case did the bacilli seen in the milk resemble the *My.* tuberculosis morphologically.

TYPHOID AND PARATYPHOID FEVERS.

Four hundred and thirty agglutination tests were made, and 21 sera gave a positive reaction with the *Eberthella typhi*, 4 gave a positive reaction with *Salmonella paratyphi* (*B. paratyphosus A*), and 3 with *Salmonella schottmulleri* (*B. paratyphosus B*). The *Eberthella typhi* was isolated from 2 specimens of blood out of 48, but almost all of these were really bloodclots, remaining after separating the serum for agglutination tests, and from 6 out of 38 specimens of faeces. Three specimens of urine were negative. Seven specimens of ice balls and 6 of ice cream, sold by

hawkers near the playgrounds of a school were examined, because three pupils were said to have contracted typhoid fever, but none of the organisms of the enteric group were isolated. This was to be expected as if the articles had been contaminated with these organisms many more cases must have occurred. One sample of sewage and 5 of wash water were also examined with negative results.

DYSENTERY.

Amoebic.—Nine hundred and ninety-six specimens were examined. The *E. histolytica* was present in 45, *E. coli* in 17, and *E. nana* in 1.

Bacillary.—Two hundred and eighty-seven specimens were received, of which only a very few presented the appearances of dysentery to the naked eye, and *B. dysenteriae* of Flexner was isolated from 3 and Hiss and Russel's bacillus from 2.

CHOLERA.

One specimen was examined and the cholera vibrio was isolated from it. The case occurred on Pulau Bukom and proved fatal.

PLAQUE.

No specimens of human origin were received.

Rats.—Five thousand nine hundred and ninety six rats were trapped and dissected, all of which were free from plague. Four hundred and thirty-three rats came from the Port Area or Ships at the wharves and the remainder were trapped in the town. The proportion of *rattus* to *decumanus* in the port and ships was 6 to 1, and in the town 1 to 4. The species and distribution of the rats dissected was as follows.

Source	<i>R. decumanus</i>		<i>R. rattus</i>		Concolor		Musulus		Croci-dura	Total
	M	F	M	F	M	F	M	F		
Port ..	26	38	150	213	4	2	—	—	—	433
Town ..	1,219	1,657	328	377	285	637	106	240	684	5,533
Total ..	1,245	1,695	478	590	289	639	106	240	684	5,966
	2,940		1,068		928		346		684	5,966

Fleas.—Three thousand five hundred and seventy-three fleas were caught or 60 per hundred rats. The index was 140 for the port and 53 for the town. The flea index thus keeps low and it is to these that we owe our immunity from plague. I was unable to carry out any experiments in flea breeding during the year. Several were started but had to be abandoned owing to other work. No identification of fleas was done during the year.

CEREBRO-SPINAL FEVER.

Twenty-eight specimens of cerebro-spinal fluid were received and the meningococcus was found in eight.

DIPHTHERIA.

Two thousand four hundred and eighty-one specimens were examined from 355 of which the *Coryn. diphtheriae* was isolated in culture. Eight hundred and seventy-nine swabs came from the inspecting officers

and the Coryn. diphtheriae was found in 19 of these. Fifteen cultures were tested for virulence of which 7 were virulent. A toxin was made from two of them but one was too weak for use, the M.L.D. being more than 0.004 ml., and the other has not yet been tested. Diphtheria is a disease that is increasing in Singapore, and in view of the heavy mortality associated, a mortality that has been noticed to be increasing in many countries, in spite of earlier diagnosis and intensive serum treatment, some writers going as far as to recommend doses of 300,000 units, I think that energetic steps should be taken to combat it. It is possible to confer immunity to the disease on children between 1 year and 5, when the susceptibility is greatest, and this might be done in connection with the infant welfare clinics.

LEPROSY.

Ninety-five specimens were examined and the My. leprae was demonstrated in 35.

Miscellaneous included:—

367 specimens of Urine for General Examination.

88	"	" Pathological Exudates for General Examination.
960	"	" Pus for Gonococci (197 + ve).
2	"	" Urine for Gonococci (— ve).
12	"	" Prostatic Smears for Gonococci (2 + ve).
4,333	"	" Faeces for Intestinal parasites (*).
1	"	" Faeces for Schistosomiasis (— ve).
2	"	" Faeces (sheep) for Coccidia (2 + ve).
1	"	" Faeces (cow) for Coccidia (— ve).
2,051	"	" Blood for Wassermann Reaction (575 + ve).
2	"	" Cerebro-spinal fluid for Wasserman Reaction (— ve).
1,793	"	" Blood for Kahn Reaction (358 + ve).
1	"	" Cerebro-spinal fluid for Kahn Reaction (— ve).
753	"	" Blood (rat) for Trypanosoma lewisi (90+ve).
3	"	" Blood for Weil-Felix Reaction (— ve).
3	"	" Blood (dog) for Filaria (1 + ve).
44	"	" Blood for Differential Count.
2	"	" Blood for Culture.
6	"	" Serum for T. pallida (1 + ve).
2	"	" Sputum for Pneumococci (1 + ve).
1	"	" Pork for Trichinella (— ve).
1	"	" Pork for Sarcocystis (+ ve).
1	"	" Pig's liver for B. necrophorus (— ve).
3	"	" Pork for Parasites (— ve).
2	"	" Fowl for P. gallinae (— ve).
1	"	" Chicken for Fowlpox (+ ve).
9	"	" Umbilicus for Tetanus (3 + ve).
1	"	" Hair for Ringworm (+ ve).
29	"	" Pathological Tissue.
206	"	" Milk.
1	"	" Bread.
1	"	" Butter.
1	"	" Minced Meat.
1	"	" Aerated Water.
12	"	" Vaccine.
6	"	" Disinfectant.
1	lot of	fleas.

(*) Intestinal parasites. Out of 4,333 specimens 811 contained ankylostome ova, 8 had strongyloids, 769 ascaris ova, 1,048 trichuris ova, 90 oxyuris, 1 tapeworm, and 23 lamblia cysts.

Wassermann Reaction—2,051 samples of blood were received and 2,041 examined. Ten samples remained over unexamined at the end of the year.

The results are as follows:—

Source	Positive +	Negative —	Doubtful Positive — +	Doubtful Negative — +	Total
Lady Medical Officer ..	347	737	25	52	1,161
Middleton Hospital ..	38	72	1	6	117
St. Andrews Hospital ..	68	131	4	8	211
Health Office ..	11	18	—	—	29
Registrars ..	87	360	10	11	468
Others ..	11	42	—	2	55
	562	1,360	40	79	2,041

The Kahn reaction was done on 1,793 specimens and agreed with the Wassermann in 87 per cent. of all cases. The percentage agreement in the different series was as follows.

Source	Agreed	W + K —	W — K +
Lady Medical Officer ..	86 per cent.	13 per cent.	1 per cent.
Middleton Hospital ..	81 „ „	10 „ „	9 „ „
St. Andrews Hospital ..	87 „ „	8 „ „	5 „ „
Health Office ..	91 „ „	9 „ „	0 „ „
Registrars ..	93 „ „	5 „ „	2 „ „
Others ..	84 „ „	6 „ „	10 „ „

In compiling this table all cases in which the Wassermann was positive, or doubtfully positive, and the Kahn positive, are considered as being in agreement, and those in which the Wassermann was negative, or doubtfully negative, and the Kahn negative, are considered to agree. The specimens from the Registrars are derived from parents, chiefly mothers, of still born children or children who have died under the age of two years. The results show that 20 per cent. of these parents are syphilitic. This is certain as there is excellent agreement, 93 per cent., between the two tests. The Health Office specimens are almost entirely from males and are sent for diagnostic purposes, from patients having symptoms or signs that might reasonably be due to syphilis. It is notable that there are no doubtful results among them, that the agreement is good 91 per cent. and that 38 per cent. are positive. Treated cases are included.

The Middleton Hospital specimens are made up partly of blood from cases admitted with skin conditions resembling one of the specific infectious diseases, usually smallpox, or measles, but which on examination prove not to be infectious but might be syphilitic, and partly of specimens of blood from convalescents which might be of importance for therapeutic uses. In the first group there was agreement in 93 per cent. and 70 per cent. were positive. In the other group made up of convalescents, chiefly chickenpox cases, the reactions agreed in 76 per cent. only.

The St. Andrews Hospital specimens are entirely from women and children, partly with definite symptoms, and partly specimens taken to control treatment. Specimens from the Lady Medical Officer are made up chiefly from women whose children are unhealthy, but also includes specimens from the fathers of children who are clinically syphilitic and also from the babies themselves. The agreement is poor, 86 per cent., and 13 per cent. are Wassermann positive Kahn negative and 1 per cent. Wassermann negative Kahn positive. Of the specimens taken from children there is agreement in 98 per cent. and 36 per cent. are positive. Among the specimens from fathers and husbands there is agreement in 90 per cent. and 7 per cent. are Wassermann positive Kahn negative, but among the women there is only 87 per cent. agreement. It was found that in women after childbirth the Wassermann may undergo a change from negative to positive but the Kahn reaction was not so easily changed.

Others. This group is notable for the large percentage of Wassermann negative Kahn positive results. It is made up partly of cases for diagnosis and partly of treated cases. In many cases for diagnosis it is admitted that the blood was taken very early in the disease and this may be the reason for so many positive Kahns and negative Wassermanns. In other cases the blood was sent to control treatment or detect relapses.

Milk.—Two hundred and six samples of milk were examined. One hundred of these were samples taken by the Chief Sanitary Inspector from dairies, distributing centres, and retail milk sellers. The samples were taken in sterilized bottles which were at once placed in special containers, and packed round with ice and hurried to the laboratory where they were at once examined. The examination consisted of a determination of the total number of colonies developing per ml. on agar at 37°C in 24 hours, and of the smallest quantity of the samples producing acid and gas in lactose bile salt broth in 24 hours. The results prove that there is great need for improvement in the methods of handling, and particularly of retailing, milk, and the supply is still far from reasonably clean. To a certain extent there is an improvement in the retailed milk. Some years ago a retail sample kept over night at room temperature underwent "stormy fermentation" and would be found scattered over the bench in a foamy spongy mass in the morning. I was unable to find any sample like that this year even when wanted for demonstration purposes. Three samples of single dairy milks averaged 38,000 colonies per ml. all contained *B. coli* in 1/10 of a ml. and 2 contained *B. coli* in 1/100 ml. Forty-two samples of bulked wholesale milk were examined. Eight of these were good in that 1 contained under 10,000 colonies per ml. and 7 under 30,000 i.e., nearly 20 per cent. had a bacterial count equal to that of certified and grade A pasteurized milk. Sixteen or 38 per cent. were under 100,000. Twelve were between 100,000 and 1,000,000 and 6 were over 1,000,000. One sample contained no *B. coli* in 10 ml. and in 1 it was present in 10 ml. In 5 *B. coli* was present only in 1 ml. in 12 in 0.1 ml., and in 8 in 0.01 ml. These results are surprisingly good and show that the dairies can produce moderately clean milk.

Multiplication of the organisms present proceeds rapidly however in this climate, and the results of examination of bottled retail milk are not nearly so good. Fifty-five samples were examined. One had less than 30,000 organisms per ml., 3 were under 100,000, 33 under 1,000,000, 13 under 10,000,000, and 4 under 25,000,000. All contained *B. coli* in 0.1 ml. in 6 it was present in 0.01 ml. and in 12 in 0.001 ml. while in 36 it was present in 0.0001 ml. No special search was made for pathogenic organisms beyond what is mentioned under Tuberculosis. In no case was a tubercular infection produced by injection of milk, into guinea pigs.

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The remaining samples were reconstituted and pasteurized milks. Forty-seven samples of reconstituted milk and 48 of pasteurized fresh milk were examined. The results were good. Of the reconstituted samples 15 per cent. had less than 1,000 colonies per ml. 74 per cent. had less than 10,000 and the remainder had less than 30,000, while 34 per cent. had no *B. coli* in 10 ml., in 60 per cent. *B. coli* was present in 10 ml., and in 6 per cent. in 1 ml. The pasteurized fresh milk was not quite so good. Six per cent. had less than 1,000 colonies per ml., 70 per cent. had less than 10,000 colonies per ml. 10 per cent. had less than 30,000 and 14 per cent. had more than 30,000 but less than 100,000 colonies per ml. Forty-eight per cent. had no *B. coli* in 10 ml. In 33 per cent. *B. coli* was present in 10 ml., in 14 per cent. it was present in 1 ml. and in 5 per cent. in 0.1 ml.

These results can be summarized as follows:—

I.

Sample	Colonies in thousands per ml. per cent. samples					
	Under 1	Under 10	Under 30	Under 100	Under 1,000	Over 1,000
Single Dairy ..	—	—	—	100	—	—
Bulk Wholesale ..	—	2	16	38	30	14
Retail Bottled ..	—	—	2	6	60	32
Reconstituted ..	15	74	11	—	—	—
Pasteurized ..	6	70	10	14	—	—

II.

Sample	Per Cent. Samples						
	B. coli absent in	B. coli present in					
		.10 ml.	.10 ml.	.1 ml.	.1 ml.	.01 ml.	.001 ml.
Single Dairy ..	0	100	100	100	66	—	—
Bulk Wholesale ..	2	98	96	84	55	36	19
Retail Bottled ..	—	—	—	100	99	88	16
Reconstituted ..	34	66	6	—	—	—	—
Pasteurized ..	48	52	29	5	—	—	—

In addition a number of special samples were examined to determine the causes of high counts and in some cases resulted in the identification of the cow responsible.

II. WATER.

Six thousand nine hundred and twenty-seven routine samples from the Municipal supply were analysed. The results were satisfactory and proved that a pure and safe water was consistently supplied to the town during the year. The number of samples is 2,571 less than last year. The reduction is due to the closing of Bukit Timah filters for the greater part of the year. The tap water, as judged by the laboratory office tap

was of excellent quality during the year, and the average of the three taps is above the average of last year as regards lactose fermenting organisms, though the total count is slightly higher. The results obtained from Pearls Hill Reservoir continue to be puzzling but the matter is being investigated slowly and the high counts there are now thought to be due to the mechanical arrangement of the pipes, though a complete explanation is not yet forthcoming. The matter is interesting from an engineering point of view rather than from a health stand point.

The following table summarizes the results obtained from the chief parts of the water supply system during the year.

Source	Total Counts	Lactose fermenters present in					
		- 100	+ 100	÷ 10	+ 1	+ 0.1	+ 0.01
Sultan Ibrahim V. T. . .	937	4.2	75.8	36.8	12.0	—	—
Sultan Ibrahim C. W. T. . .	58	67.2	32.8	9.5	0.4	—	—
Seletar Res. V. T. . .	340	3.7	96.3	63.1	14.5	0.4	—
Pierce Res. V. T. . .	104	1.3	98.7	59.3	9.1	—	—
MacRitchie Res. V. T. . .	115	0.8	99.2	68.1	11.2	—	—
Bukit Timah Raw . . .	208	12.5	87.5	50.0	18.7	(January 4th to 26th)	
Woodleigh Raw . . .	197	6.3	93.7	36.2	2.9	—	—
Pearls' Hill I. . .	365	15.7	84.3	32.6	2.5	—	—
Pearls' Hill II. . .	361	16.7	83.3	35.4	3.8	—	—
Fort Canning Res. . .	131	56.4	43.6	5.8	0.4	—	—
Tap (Office) . . .	70	92.5	7.5	—	—	—	—
Tap (Lorong Lalat) . . .	45	91.8	8.2	1.6	0.8	—	—
Tap (Havelock Road) . . .	189	46.5	53.5	9.5	0.4	—	—
Tap (average of 3) . . .	101	76.9	23.1	3.7	0.4	—	—

Two hundred and forty-three miscellaneous samples were examined, including four daily samples from Mount Emily Swimming Pool, daily samples from the Y.M.C.A. pool, and samples from the pools at Tanglin club and the Swimming Club. The following table gives the results at Mount Emily and shows that a clean and pure bathing water was maintained throughout the year. The whole supply is now chlorinated. The Mount Emily results are summarized below.

Source	Total Counts	Lactose Fermenters present in					
		- 100	+ 100	÷ 10	+ 1	+ 0.1	
Shallow End 7 a.m. . .	251	60	40	16	4	0	
Deep End 7 a.m. . .	358	54	46	21	6	0	
Shallow End 2 p.m. . .	88	83	17	7	1	0	
Deep End 2 p.m. . .	107	79	21	10	2	0	

III. SEWAGE.

Forty-nine samples of chlorinated sewage from the Middleton Hospital were examined. The results were not so consistently good as last year, owing to flooding of the tank, and defective working of the apparatus. The average colonies per c.c. of effluent was 33,000 but during 6 months of the year it was only 600. Ten per cent. of samples had no *B. coli* in 100 ml. *B. coli* was present in 100 ml. in 90 per cent. of samples, in 10 ml. in 68 per cent., in 1 ml. in 60 per cent., in 0.1 ml. in 34 per cent., in 0.01 ml. in 24 per cent. and in 0.001 ml. or less in 16 per cent.

Twenty-five samples of wash water were analysed for the Conservancy Department and were satisfactory.

Two hundred and twenty-three examinations were carried out for the Sewerage Department in connection with the proposal to dispose of sewage by pumping it out to sea.

Experiments were carried out on the purification and dilution of sewage by mixing with sea water. It was found that in a closed body of sea water there was first of all a fall in the number of organisms for about 8 hours, followed by enormous multiplication for about 4 hours after which the numbers slowly fell until in 24 hours they had reached the number originally present. Starting with a dilution of 1 or 10 on three experiments the actual dilution by bacterial count at the end 8 hours, 16 hours and 24 hours were 1 in 8.25, 1 in 9.6, and 1 in 7.7 respectively when all tanks were examined during the same hours of the day. In another experiment carried through for 24 hours the final dilution was 1 in 25, starting with 1 in 10.

Experiments were carried out on sewage dilution in the sea at Seletar in conjunction with the Municipal Analyst. An endeavour was made to make these experiments more exact by using *B. prodigiosus* as indicator. Dilutions of 1 in 90 to 1 in 450 were obtained using the total colonies as indicators but *B. prodigiosus* was only recovered once, indicating a dilution of 1 in 50.

Larve in Sludge.—Examination of sludge for infective hookworm larvae was continued. When the sludge from the Imhoff Tanks is examined hookworm ova can be easily demonstrated. These were isolated and found to be alive after being in the tanks for as much as 88 days.

Development into infective sheathed larvae could be followed from day to day and it is evident that the sludge from these tanks is dangerous. It has been shown by Hirst in Colombo that ground in which septic tank sludge was buried was infective for at least 3 years.

It was decided to heat all the sludge from the Imhoff tanks before it is disposed off. The sewage engineer has been able to do this by utilising the gases given off by the tanks as fuel. To begin with the sludge was raised to 135° F for 40 minutes. It was found however that round worm eggs (*Ascaris lumbricoides*) which are present in enormous numbers still continued to develop and the sludge is now raised to a temperature 150° F for 40 minutes.

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IV. MORTUARY.

There were two postmortems and in addition 1 dead body was sent for inspection.

The causes of death were:

Diphtheria	...	...	...	1
Septicaemia	...	...	...	1
Smallpox	...	...	...	1

I have the honour to be,

Sir,

Your obedient servant,

COLIN C. B. GILMOUR,

M.A., M.B., Ch.B.,

Municipal Bacteriologist.

MUNICIPAL HEALTH OFFICE,

Singapore, 6th March, 1933.

THE MUNICIPAL HEALTH OFFICER.

SIR,

I have the honour to submit my report for 1932.

During the year 14,309 new babies were taken on the registers of the infant welfare clinics—this figure represents 87% of the total births of the town and compares favourably with the 75% of 1931.

41,215 ‘consultations’ were held in these 3 clinics. Last year’s number was 24,708 and the increase of 16,507 attendances in one year may be partly accounted for by the continuation of the slump and the larger number of really destitute people who brought their babies to the clinics for weekly supplies of (free) milk, codliver oil, etc. It is also due to the closing-down of the Government Dispensary in Joo Chiat Road. The latter was the nearest source of medical attention for the large area between Frankels Estate, Telok Kurau and East Coast Road. Children of all ages attended this clinic, and they are now brought for advice to the Municipal Infant Welfare Clinic at Joo Chiat. In addition to these older children who ask for treatment of minor ailments, an increasing number of adult patients come for advice and help which cannot be refused, as the nearest hospital is 4 or 5 miles away and many patients cannot afford the necessary transport. These adult patients are mostly “sick mothers” but also their relations and friends. A Dispensary for women and children is a real need in this part of the town, if the Municipal Clinic is to be strictly reserved for infants, e.g., children under 1 year. Another reason for the increasing popularity of the welfare clinics, is, I think, the growing confidence of the mothers in the advice and simple treatment they receive there.

The larger attendance at the clinics did not affect the number of visits paid by the Health Visitors in the babies’ houses. These numbered 97,202, as compared with 87,795 the year before—the higher figure being due to improved clerical organisation. There was no addition to the staff of nurses.

To the death of 1,324 ‘clinic’ babies must be added, as usual, many of the 4,306 ‘removals’ e.g., clinic babies whose change of address was not notified and who were not subsequently traced.

As the clinic babies comprise 87% of the total births of Singapore, the clinic infantile death-rate may be considered that of the city, which was 180.5 per mille, the lowest figure yet recorded.

The four District Sisters paid a total of 19,173 visits, of which 14,758 were ‘first visits’ i.e., visits which are paid to newly-born babies and their mothers and which include supervision of the attending midwife. In 348 (poor) cases where there had been no midwife, and where her services were required for mother or baby, the Municipal Midwife was sent to give the necessary “post-natal” assistance. That poor mothers can obtain the services (free) of the (two) Municipal Midwives is a fact which is either not widely known or unappreciated. During 1932, the number of self-attended births (i.e., no midwife) was 3,452, while the Municipal

Midwives were called to only 250 such (poor) confinements. This low figure (250 cases) is however an improvement on last year's (174) and the Municipal Midwives' time was occupied by the 'post-natal' cases already described as well as in assisting in the work of the clinics. Their total visits amounted to 3,695.

All licensed widwives may enlist the (free) services of medical men for such patients who require them during their confinement and who are too poor to pay a doctor's fee. A panel has been formed for this purpose, the Municipality paying the doctor an inclusive fee of \$15 per patient; in 1932, 28 such 'panel' cases were treated—last year the number was 72.

The remainder of the District Sisters' visits include 3,035 revisits (to ill mothers) and 1,350 visits paid to wrong addresses.

Of the 14,758 mothers mentioned as 'first visits,' 790 were found to be ill, and 62 had died—another 138 had removed. A large number (10,279) were living in cubicles or huts, and 3,452 as already stated had had no skilled attention at their confinements.

Of the 14,833 babies of these mothers (there were 75 pairs of twins) 14,021 were actually seen by the District Sisters (and so transferred to the clinic registers)—the other 812 being reported as "nursed out" (299) or dead (513).

Of the 14,621 babies seen, 690 were described as 'ill' and another 185 were suffering from umbilical sepsis without constitutional disturbance.

568 patients were sent to hospital, 315 as in-patients and 253 as out-patients. The latter figure includes the wassermann positive mothers who went to hospital V.D. Clinics for treatment.

CHANGES IN STAFF.

Mrs. (Sister) Lowick was invalidated from the Service in April, 1932, owing to ill-health. She had worked in the department for 6 years and rendered faithful and ungrudging service both as clinic and district sister.

In June, Nurse Lee Suk Yin was promoted to the post of Staff-nurse and as such was able to fill the vacancy caused by Mrs. Lowick's resignation and to carry out her duties of "District Sister." Nurse Lee Suk Yin has given every satisfaction and proved herself entirely worthy of her promotion.

INFANTILE MORBIDITY.

The lower infantile death-rate of Singapore must mean an improvement in the general health of its babies, nevertheless, a large number of sick babies were brought to the clinics—the majority suffering from disorders of nutrition or from respiratory disease, as was noted last year. Chronic Otitis Media continued to be very prevalent, especially in older debilitated babies, and many newly-born infants were found to be suffering from purulent conjunctivitis—the gonococcus being the causal organism in 82 (38%) of the 215 cases that were tested bacteriologically.

There were fewer cases of boils than last year and only 15 cases of malaria were seen.

The most important cause of chronic ill-health (and therefore a predisposing cause of death) was found to be congenital (inherited) syphilis. In 1931's Report this fact was alluded to as a strong suspicion, and during 1932 it has been confirmed by two series of investigations to be described under A and B.

A. An effort was made to examine the blood (by the wassermann and kahn tests, the two most reliable serological tests (for syphilis) of all mothers whose babies were failing to make satisfactory progress—in order to diagnose, or exclude, the possibility of, inherited syphilis as the cause of their ill-health.

The majority of such mothers consented to having their blood tested, and during the year a total of 1,161 samples of blood was collected at the clinics and sent to the Municipal Bacteriological Department where they were examined by Dr. Gilmour.

This figure (1,161) includes a certain number of babies (27), and older children (13), husbands (191), and 'volunteers' (e.g., women who came to the clinics asking for a blood test for such reasons as sterility, series of miscarriages, etc.), but it consists mainly of those mothers whose babies either appeared unhealthy or who were failing to gain in weight. Of these 1,161 wassermann tests, 347 were 'positive' (32%) e.g., diagnostic of syphilis, and 737 negative—the remaining 77 being 'doubtful.' Most of the mothers of 'sick' babies who were found to be suffering from spirochaetal infection, as proved by the wassermann test, had varying degrees of anaemia, and other signs of the disease.

It may be noted here that in view of the prevalence of anaemia, 261 mothers were tested for the presence of hookworm infection, but this was only found in 38 cases, (14.5%).

The 294 cases about to be described consist of 271 babies whose mothers had a positive wassermann, and of 20 whose mothers were serologically negative but whose fathers were positive, of one case where the mother had died, but her husband too had a positive wassermann reaction and lastly of two babies whose mothers had negative wassermanns and whose fathers' blood was not tested—but the infants themselves had positive wassermann reactions.

Their nationalities were	249 Chinese	
	25 Malays	
	17 Indians	
and	3 Eurasians	
		<hr style="width: 10%; margin: 10px auto;"/>
		294
		<hr style="width: 10%; margin: 10px auto;"/>

The 294 mothers represent a total of 1,092 pregnancies the average parity being just under 4. 57 (e.g., 5%) of these pregnancies had ended in miscarriages, and of the remaining 1,035 children, 352 had died—making a death-rate of 340 per mille. This figure is much higher than the general infantile-rate (180.5 in 1932 and 200 in 1931) and represents a great waste of life.

Throughout the year, we tried to keep these 294 presumably syphilitic babies under medical supervision and their parents were encouraged to bring them to the clinics twice a month for clinical examination and (free) supplies of mercury and arsenic—these drugs being given orally in the form of hydrag. cum cret. gr. i daily, and "orarsan" gr. $\frac{1}{4}$, four times a week. The mothers themselves were urged to get anti-syphilitic treatment, and the serious nature of the disease and its disastrous effect on child-bearing, was explained to them. They were sent to the V.D. Clinics of Kandang Kerbau, the General, and St. Andrews Hospitals, and told how to prepare themselves for an intravenous injection.

We also advised them to bring their husbands to the clinics for a wassermann test. 140 (husbands) actually came and 91 (65%) of them were found to be suffering from syphilis also—the other results being 46 negative wassermanns, 2 anti-complementary, and 1 'doubtful.' The 91 'positive' men were given notes of recommendation to V.D. Clinics, and the 154 husbands who failed to come for a blood test, were sent letters requesting them to go to the nearest V.D. Clinic for this purpose.

As already mentioned, all the 294 babies' health was poor, and 109 (37%) showed definite and unmistakable 'clinical' signs of congenital syphilis, such as the typical facies, the square 'rickety' head, much-enlarged liver, spleen and lymphatic glands, with 'snuffles' and the weak, hoarse cry of syphilitic laryngitis.

A few of the 294 babies were described as ill since birth, but the large majority had remained well until the age of 3 to 6 months, when anaemia, crops of boils, chronic otorrhoea, or more failure to gain in weight caused them to be classified as 'sick' and so investigated for congenital syphilis.

Up to date, 107 babies (36%) have definitely improved on the small doses of 'grey powder' and mercury already mentioned; 43 (14%) have died, and 44 have removed and cannot be traced. The remaining 100 show no improvement but few of these last have attended regularly enough to hope to benefit by such treatment as we could offer.

27 of the 294 babies had their blood tested, 17 cases being wass-positive, and 10 negative. These findings are interesting enough to describe in some detail, and go to prove that a negative wassermann reaction can NOT be taken as a proof of the absence of spirochatal infection—this is particularly true in the case of pregnant or recently confined women, where the wassermann findings may be quite unreliable—the same (untreated) woman, tested on say, 3 different occasions, may give three different reactions (such as negative, doubtful and positive—usually in this order). We have recently come across several such cases, but have not yet sufficient data to make any explanatory hypothesis.

Of the 17 wass. positive babies in question, one had a (Uniovular) twin-brother whose wassermann reaction was negative—this is an exceedingly interesting, if not unique, case. Another two wassermann reaction positive babies had mothers with negative wassermanns (their fathers' were not tested but are presumably 'positive'). In a fourth case of wassermann positive baby, the mother was dead, but the father's blood was tested and found to be positive.

Of the 10 'negative' babies, one was the brother of the 'positive' twin already mentioned, another had a 'negative' mother, but its father was positive, while a third had a 'doubtful' mother and a strongly-positive father.

Of the 271 wassermann-positive mothers, 31 (11%) again became pregnant, with the following results; 11 have confined; 3 miscarried; and 17 are still undelivered. Of the 11, 6 had apparently healthy babies after having received 8, 7, 5, 4, 3 and 1 injections of 'NAB' during their respective pregnancies. The one who had only one injection has now a negative wassermann. These 6 babies attend the clinic and are being watched for signs and symptoms of syphilis.

4 others, who refused anti-specific treatment, are also delivered, 3 of these babies are alive, but obviously syphilitic; the fourth was premature and still-born.

The 11th case is both unusual and very disappointing. Both parents had strongly positive wassermann, but the mother had 24 injections, to the great benefit of her own health—the father had 16. An apparently healthy baby ($6\frac{3}{4}$ lbs.) was born and died suddenly, without apparent cause, when 9 days old. There were no obvious "clinical" signs of syphilis, but no post-mortem examination was made, so the cause of death remains unknown.

Of the 3 women who miscarried (at about the 4th month of pregnancy), one had had 2 injections, the other two none.

Of the 17 still undelivered, one has had 16 injections and her wassermann reaction is now negative, another has had 11, another 9 injections, two have had 5, two 4, two 3, two 2 and one 1 only. Up to date the remaining 5 have had no treatment.

Altogether 126 of the 271 Wassermann positive mothers have had a certain amount of anti-syphilitic treatment, and the number of injections received is tabulated below.

1 woman	had 24 'injections'
1 "	" 20 "
2 women	" 16 "
1 woman	" 15 "
3 women	" 11 "
6 "	" 10 "
2 "	" 9 "
6 "	" 8 "
9 "	" 7 "
3 "	" 6 "
11 "	" 5 "
10 "	" 4 "
23 "	" 3 "
18 "	" 2 "
28 "	" 1 "
2 "	" 'several.'

The remaining 145 had no treatment. It will be seen from the above table that few women submitted to anything like a 'complete' course of treatment and that a large number had only two or three injections. These results would have been even more discouraging if most of the women had not been specially visited and urged to get treatment. There is much fear, ignorance and superstition to combat, and although, of course, all anti-venereal treatment is free, the question of transport is a real problem in many cases. Some women say they cannot leave their homes and children for so long a time as appears necessary to obtain treatment—others complain of local pain or of constitutional disturbance after the injections—but these latter are few.

B. The second investigation was carried out in collaboration with Dr. Lee Lian Hoe, who took samples of blood of 442 mothers whose infants (e.g., children under 12 months) had died during the year. 21.95% of these mothers were found to have positive Wassermanns.

Altogether, 146 such cases were investigated on the same lines as described under A.

(85-D)

The notified causes of death are tabulated below and are interesting because only 3 were attributed to syphilis, which must have been the predisposing cause of the majority.

Still-births	...	...	...	31
Convulsions	...	...	...	37
Gastro-enteritis	...	...	...	20
Respiratory diseases	...	...	...	20
Congenital debility	...	...	...	28
Syphilis	...	...	...	3
Septicaemia	...	...	...	3
Acute enteritis	...	...	...	2
Ascariasis	...	...	...	1
Ictorus neo natarum	...	...	...	1
				146

It must be remembered that 'convulsions,' and 'congenital debility' are not true diseases, but symptoms of disease.

The nationalities were 90 Chinese
41 Malays
14 Indians
and 1 Eurasian

146

The 146 mothers represent a total of 574 pregnancies, e.g., an average parity of 4, as in series A. 31 (5%) of these pregnancies also ended in miscarriages, and 323 of the 543 children had died. This makes an exceedingly high death-rate of 594 per mille.

The 146 women were interviewed and given letters of recommendation to V.D. Clinics. About 50% of them were in very indifferent health, but 89 refused treatment. The other 54 consented to go for NAB, but only 5 (see table below) had 10 or more injections while 18 went once only.

1 woman had 24 'injections'				
1	"	"	20	"
1	"	"	16	"
1	"	"	12	"
1	"	"	10	"
1	"	"	9	"
2	women	"	8	"
3	"	"	7	"
5	"	"	6	"
1	woman	"	5	"
5	women	"	4	"
6	"	"	3	"
7	"	"	2	"
18	"	"	1	"
4	"	"	'several.'	

(86-D)

The reasons for this poor attendance being similar to those given under A.

33 wives brought their husbands for a blood-test, of these, 22 (69%) were positive, 9 negative, 1 doubtful, and 1 anti-complementary. The positive men were sent to V.D. Clinics and letters were sent to as many as possible of the (untested) 113.

All the 146 women were advised to attend the clinic if they became pregnant again, and it is likely that such WR positive women would form the most important part of an organised ante-natal clinic. But I do not think that simple ante-natal work, without anti-venereal treatment, would justify the time and expense it would involve. Apart from venereal disease and a certain amount of beri-beri, few complications of pregnancy are seen, but the need of systematic treatment of syphilis in the pre-natal stage is in my opinion both urgent and essential if any further improvement is to be made on the infant welfare of Singapore.

A list of the bacteriological work done for the clinics by Dr. Gilmour is appended.

Materials	Total
'Smears'	... 215 of which 82 were 'Positive' (Gonococcus Present).
Blood-films	... 255 of which 15 were 'Positive' (Malarial parasites present).
Faeces	... 261 of which 131 were 'Positive' (Hookworm 38), (Other Ova) 92), entamoebae histolytica 1.
Urine	... 139
Venous Blood for	
Wass. reaction ...	1,161 of which 347 were 'Positive.'
	737 were 'Negative.'
	25 were 'Doubtful' inclining to positive.
	52 were 'Doubtful' inclining to negative.

I have the honour to be,

Sir,

Your obedient servant,

ELSIE V. CROWE,

Lady Medical Officer.

MIDDLETON HOSPITAL,

Singapore, 1st February, 1933.

THE MUNICIPAL HEALTH OFFICER,
SINGAPORE.

SIR,

I have the honour to present the annual report of the Middleton Hospital for the year 1932.

The following table summarises the cases treated during the year.

Disease	Remaining from 1931	Admitted	Discharged	Died	Remaining
Smallpox	—	7	4	3	—
Cholera	—	—	—	—	—
Plague	—	—	—	—	—
Chickenpox	30	491	497	—	24
Measles	—	7	7	—	—
Diphtheria	4	90	68	23	3
Cerebro-spinal Fever	—	6	—	6	—
Erysipelas	—	—	—	—	—
Whooping Cough	—	3	3	—	—
Mumps	3	22	24	—	1
Contacts	1	36	37	—	—
Rubella	—	4	4	—	—
Enteric Fever	—	1	—	1	—
Tuberculosis	1	2	3	—	—
Other diseases	—	55	50	5	—
Total	39	724	697	38	28

The number of patients admitted this year has been exceeded only in 1929, and is 291 more than last year. The increase is due to Chickenpox, for 295 more cases of that disease were admitted than in 1931.

1. **Smallpox.** Seven cases were admitted of whom 3 died. Five of the patients had no vaccination marks. One fatal case was haemorrhagic in type, and two were confluent. The others, who recovered, were discrete. In addition a body was brought to the hospital, dead of smallpox, about the eighth day of the disease. This body led to the discovery of two cases, and it is unfortunate that the disease was not recognized earlier, for which there was little excuse, as then the haemorrhagic case, and one discrete case, might have been prevented.

2. **Cholera and Plague.** There were no cases during the year, and none have been admitted during the last four years.

3. **Diphtheria.** This continues to be the most serious disease treated, and it is becoming more common. Ninety cases were admitted against 46 last year. The crude mortality was 25.5 per cent. Sixteen cases died within 24 hours of admission and deducting these the mortality was 9.4 per cent. There were 27 cases of laryngeal diphtheria of whom 21

required tracheotomy. Thirteen of these died, 9 within 24 hours of admission, and the remainder recovered. Nearly half of the patients were under the age of 5 years and just over a third were between 5 and 9 years. Parents still delay too long before bringing the children to hospital because they don't realize the deadliness of the disease until alarming symptoms occur, for which relief is sought, too late, the heart already poisoned beyond recovery.

4. **Chickenpox.** This disease accounted for slightly more than half of the admissions. The nationalities were Indians 381, Chinese 61, Malays 24, Eurasians 23, Europeans and Japanese 1 each, and the total number of days spent in hospital for this disease was 6,109. Most of the cases in former years have been our own coolies but this year there were only 171 cases from the Municipal Staff, 59 from Government, 49 from Institutions such as the Poh Leong Kok and no less than 212 from private sources. Of 491 admissions only 67 were children or attending school. Isolation in hospital does little to check the spread of the disease which seems to be infectious only in the very early stage, before the appearance of the vesicles.

5. Other Diseases. Of 55 patients admitted suspected of suffering from an infectious disease and found to have some other diseases, 5 died. The causes of death were Marasmus 1, Broncho-pneumonia 3, Meningitis 1. The remainder were discharged or transferred to other hospitals.

6. Nationalities. The patients belonged to the following nationalities.

Europeans	...	...	10	for	129	days
Eurasians	...	...	42	„	545	„
Chinese	...	...	190	„	2,529	„
Malays	...	...	43	„	522	„
Indians	...	...	438	„	5,666	„
Others	...	...	1	„	9	„

The total number of days spent in hospital including patients remaining from 1931 was 9,830, as compared with 5,440 last year.

7. The following table shows the admissions to Middleton Hospital during the past ten years.

Diseases		1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
Cholera	..	—	—	—	16	20	4	—	—	—	—
Smallpox	..	2	8	9	30	16	8	9	—	3	7
Plague	..	29	11	21	1	2	3	—	—	—	—
Chickenpox	..	172	210	277	155	180	324	553	334	196	491
Diphtheria	..	18	17	32	25	16	42	38	35	46	90
Cerebro-spinal Fever	..	6	13	7	6	14	13	3	17	6	6
Influenza	..	—	—	—	—	—	—	—	—	2	—
Measles	..	20	29	49	70	69	94	42	60	58	7
Erysipelas	..	8	5	2	11	3	6	1	7	1	—
Mumps	..	6	—	27	47	79	48	66	10	17	22
Whooping Cough	..	1	—	1	6	4	8	1	14	20	3
Typhoid Fever	..	1	—	1	3	1	—	—	1	1	1
Tuberculosis	..	2	—	1	1	—	1	1	1	1	2
German Measles	..	—	21	7	3	18	7	6	5	14	4
Scarlet Fever	..	—	—	—	1	—	3	6	—	—	—
Typhus Fever	..	—	—	—	—	—	1	—	—	—	—
Puerperal Fever	..	—	—	—	—	1	—	—	1	2	—
Contacts	..	—	—	—	19	18	42	45	17	48	22
Other Diseases	..	15	41	17	32	52	63	63	44	44	55
Total	..	280	355	470	425	517	670	806	577	433	724

(89-D)

8. The students from the Medical College attended for clinical instruction in infectious diseases.

9. Two thousand and ninety-five Municipal Employees were treated for hookworm infestation. In this series two deaths occurred due to the toxic action of the drug employed viz Ol. Chenopodii. Treatment was suspended and has not yet been resumed.

I have the honour to be,

Sir,

Your obedient servant,

COLIN C. B. GILMOUR,

M.A., M.B., Ch.B.,

Medical Superintendent.

(90-D)

MUNICIPAL HEALTH OFFICE,

Singapore, 2nd February, 1933.

THE MUNICIPAL HEALTH OFFICER,

SINGAPORE.

SIR,

I have the honour to submit my 13th Annual Report on the condition of the Municipal Markets, the inspection of Foodstuffs exposed for sale in them and in the shops and stores of the city.

MUNICIPAL MARKETS.

No new markets have been built this year. At the latter end of the year half of Peoples Park was fenced off and handed over to Superintendent Town Cleansing. Joo Chiat Market has not been a success, only 10 stalls being permanently occupied, though several are being paid for regularly each month. Absolutely no fresh fish is sold here, although all rents were reduced by half.

The private market at Morse Road was renovated and new stalls erected according to my plan and it is now in very good condition.

(a) CLEANSING.

This has been kept up to standard. The annual clear out took place at Chinese New Year and 7 rats were caught during operation. At Telok Ayer we had the services of the Fire Brigade through the courtesy of its chief and the work was completed more thoroughly and expeditiously than ever before.

(b) REPAIRS.

Clyde Terrace was completely overhauled and painted. All meat tables were recovered with zinc.

Ellenborough. The floor of the main market was broken up and relaid.

Telok Ayer. The old fish section was handed over to Superintendent Town Cleansing in February necessitating new fish slabs being erected in the main market. A new office was erected in the old barber's shop and the whole of the market was painted grey making it much brighter.

Orchard Road. The sliding gates were repaired, also the railings at the rear. To combat the fly nuisance all joints in the floor were cleared out and filled with hot bitumen.

Kandang Kerbau. All gates repaired. The market latrine was converted to the water carriage system and access to it given from the main roads adjoining making it into a public latrine.

Peoples Park Hawkers Shelter. Flooring repaired where necessary and all woodwork, etc., treated with preservative.

All Markets. Lighting and water service maintained in working order. With the exception of Grange Road and the Eating section of Ellenborough Market which I hope to get done this year the markets are all in excellent condition.

UNSOND FOODSTUFFS.

140,888 catties of unsound foodstuffs were conveyed to the incinerators for destruction by our coolies.

PRICES AND QUANTITY OF FOODSTUFFS.

On million catties or 600 tons more wet fish passed through Clyde Terrace Market but a decrease of over 600,000 catties passed through Ellenborough. This is said to be due to less fish being taken in local waters. Clyde Terrace is mostly supplied by Japanese caught fish. The average price at Clyde Terrace was 13 cents per catty. At other markets 22/25 cents per catty was realized. All other recorded foodstuffs with the exception of cheap bean sprouts and bean cakes show decreased quantities, and the total value dropped from \$5,041,498 to \$4,073,199 or the equivalent of nearly 20%.

Mutton was sold at 30 cents per lb. early in the year, then it rose to 35 cents until November when it dropped to 25 cents per lb. On the whole however prices have fallen very considerably.

Comparative table of prices of staple articles of food.

ARTICLE	Per	1914	1924	1928	1932	
		Av: Price	Av: Price	Av: Price	Av: Price	
Beef	..	Kati	.25	.41	.53	.35
Mutton	..	"	.35	.62	.55	.36
Pork	..	"	.38	.63	.60	.47
Tea	..	"	.50	.92 pkt.	.98 pkt.	.84 pkt.
Coffee beans	..	"	.36	.47	.67	.39
Sugar	..	"	.07	.14	.09	.05
Salt	..	"	.02	.03	.04	.03
Potatoes	..	"	.07	.12	.11	.07
Yam	..	"	.03	.06	.07	.04
Onions	..	"	.06	.09	.11	.06
Ducks	..	Dozen	6.00	9.60	10.20	6.00
Pigeons	..	Pair	.75	1.10	1.20	.80
Eggs (hens)	..	Dozen	.30	.52	.55	.39
Capon	..	Kati	.42	.73	.91	—
Fowl	..	Each	.55	.53	1.85	.70
Rice	..	Gantang	.33	.57	.45	.28

From the above table it will be noted that all prices are well below 1928 figures (25% to 35%) and in some cases approximate the prices ruling in 1914.

(92-D)

REVENUE.

MARKET	1929		1930		1931		1932	
	\$	cts.	\$	cts.	\$	cts.	\$	cts.
Clyde Terrace ..	175,941.98		163,492.65		135,399.03		120,583.78	
Ellenborough ..	116,722.59		108,947.37		93,524.63		80,176.91	
Telok Ayer ..	29,208.30		29,290.31		27,250.93		23,210.57	
Orchard Road ..	14,090.50		13,927.50		15,962.00		14,814.50	
Kandang Kerbau ..	19,651.00		18,892.00		18,811.50		18,617.00	
Grange Road ..	2,130.00		2,628.00		2,247.00		1,850.00	
Geylang ..	3,979.00		3,919.00		577.00		Abolished	
Sims Avenue ..			1,345.00		4,034.00		4,288.50	
Maxwell ..	11,904.00		449.00		9,152.00		8,280.00	
Peoples Park ..	13,889.00		14,176.00		13,254.50		12,936.00	
Joo Chiat ..	3,120.00		3,350.00		3,178.00		1,288.00	
Total ..	390,636.37		360,416.83		323,390.59		286,045.76	

5% Commission on Fresh Fish Sale.

MARKET	1927		1928		1929		1930		1931		1932	
	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.
Clyde Terrace	122,158.66		107,983.64		120,051.98		110,660.65		84,582.03		73,861.78	
Ellenborough	77,826.62		75,703.26		71,866.59		64,071.37		50,016.13		40,069.91	
Telok Ayer	2,769.82		2,330.87		1,903.30		1,462.31		1,037.93	*	490.07	
Total ..	202,755.30		186,017.77		193,821.87		176,194.33		135,636.09		114,421.76	

* 11 months only.

In every market there has been a decrease due to the failure of firms doing business and in the case of 5% commission on wet fish due to the low prices obtaining at auctions. Even Kandang Kerbau the most patronized retail market shows a slight falling off in stall rents.

STAFF.

During the year the staff was reorganised in such a way as to make it possible to dispense with the services of 7 out of 9 market Keepers. 4 Overseers on smaller salaries taking the place of the 7.

37 of the coolies were treated by M.O. i/c. staff, 3 being sent to hospital with chickenpox. One coolie died and has not been replaced.

GENERAL.

On retirement of age limit of the auction clerk at Telok Ayer the auction of fish was abolished here. It only produced about \$1.00 a day and really did not pay to collect.

(93-D)

Two sample aluminium (1 meat and 1 fish) were supplied for trial without obligation by a local firm and were replaced in Orchard Road Market. A report on their suitability will be rendered after six months. Joo Chiat Market is still little used by the public. Sims Avenue and Maxwell are improving considering the hard period now being experienced.

TOWN.

11,203 items as shown in attached return were collected from shops and stores and destroyed at the incinerators.

Surveys of foodstuffs including hams, cheese, potatoes, bacon, milk and mince-meat have been made at request of owners and advice as to disposal was accepted in each case.

Samples of all kinds have been obtained for the Municipal Analyst particulars of which will be found in his report.

I attach returns showing the amount of foodstuffs passing through the Markets with their approximate value, the quantity of unsound foodstuffs destroyed and a summary of vacant stalls as on 31st December, 1932.

I have the honour to be,

Sir,

Your obedient servant,

M. N. MACMAHON,

Cert. R. San. Inst.,

Food and Market Inspector.

UNSOND FOODSTUFFS DESTROYED DURING 1932.

(94-D)

Market.	Wetfish ctts.	Saltfish ctts.	Beef ctts.	Mutton ctts.	Pork ctts.	Vegetables ctts.	Fruits ctts.	Tinned Goods.		Bottles preserves No.	Eggs No.	Miscellaneous.	Total Items.
								Cases.	Tins.				
Clyde Terrace ..	21,565	1,909	3,623	46	..	19,637.	5,069	246	..	868	..	467	
Ellenborough ..	3,591	863	22	...	73	1,225	60	30	..	553	..	3,607	
Telok Ayer ..	387	61	6	11	6	17,808	15,920	144	..	2,110	..	294	
Kandang Kerbau ..	863	87	72	45	..	5,649	3,693	158	..	323	..	142	
Orchard Road ..	671	4	5	..	19	6,384	9,650	..	..	138	..	..
Other Markets ..	1,990	91	141	8	145	5,475	2,485	38	..	1,508	..	903	
	29,067	3,015	3,869	110	243	56,178	36,877	..	..	616	..	5,500	
Town ..	..	..	1,300	9	Hams 572	50	250	1,029	7,589	109	..	Cheese 165 lbs. Sugar 130 lbs.	11,203
Total ..	29,067	3,015	5,169	119	815	56,228	37,127	1,029	8,205	109	5,500	5,708	152,091

M. N. MacMAHON,

Food and Market Inspector.

RETURN OF SOME OF THE FOODSTUFFS PASSING THROUGH MARKETS DURING 1932.

Market.	Wetfish cts.	Boiled fish cts.	Shell fish cts.	Beef cts.	Mutton cts.	Pork cts.	HEADS				Approximate Value. \$	cts.	
							Fowls	Capons	Geese	Ducks.	Pigeons.		
Clyde Terrace ..	14,743,592	36,615	6,702	329,454	186,307	316,563	28,114	..	2,743	21,490	6,877	..	240,419
Ellenborough ..	4,180,487	8,853	199,617	17,579	900	541,931	24,321	1,043	1,963	24,439	..	..	133,749
Telok Ayer ..	58,062	..	55,780	20,930	63,010	208,410	40,245	..	603	16,372	1,189	259	..
Kandang Kerbau ..	1,044,976	21,914	40,356	163,970	156,010	515,974	61,984	116	116	6,432	..	..	45,053
Orchard Road ..	229,403	19,266	..	154,506	33,769	295,392	56,293	154	211	3,974	4,254	41	46,328
Total ..	20,756,520	86,648	302,455	686,439	439,996	1,878,270.	210,957	1,313	5,636	72,707	12,320	300	465,549
													97,595
													\$4,073,199.09

M. N. MacMAHON,

Food and Market Inspector.

SUMMARY OF VACANT STALLS END OF DECEMBER 1932.

(96-D)

M. N. MacMAHON,
Food and Market Inspector.

HEALTH DEPARTMENT.

Return of Prosecutions for Year ending 31st December, 1932.

OFFENCES.	TOTAL			\$ cts.
	Prosecutions	Withdrawn	Not Served	
Municipal Ordinance 135.				
Obstructions	Section 116
Offensive matter flowing into Public Drain	127
Establishing a private market	191
Unlicensed Offensive Trades	204
Using nightsoil/ or urine as manure	54
Latrine etc. notice not complied with	206
Nightsoil kept for more than 48 hours	212
Filthy premises	216
Limewash notice not complied with	226
Non-compliance of notice for the destruction of rats and mice	227
Non-compliance of notice of demolition order of insanitary dwelling	228
Allowing premises to be overcrowded	229
Non-compliance with Nuisance Notice	230
,, ,, Order	239
,, ,, Closing Order	240
<i>Carried forward</i> ..				9
				286
				30
				247
				870 00

(97-D)

HEALTH DEPARTMENT.

Return of Prosecutions for Year ending 31st December, 1932—(Contd.)

OFFENCES.	TOTAL			\$ cts.	
	Prosecutions	Withdrawn	Not Served		
Brought forward ..	286	9	30	217	870 00
Non-compliance of order for demolition of house unfit for human habitation	241	
Non-compliance with Well Notice	247	3 50
Opening Well without permission	247	2
License not exhibited	371	—
Failing to appear in court in answer to a S/S.	1	14 50
Byelaws-Sections 57 and 204 M. O. 135.				473	334
Unlicensed Foodshops	51	88
, Milk Vendors	—	4
Recovery of Daily fines	2	5
Employing women without permission of H.O.	10	3
Breaches of the Piggery Byelaws	373	63 50
Unlicensed Piggeries	5	1,701 00
Filthy Stables, Cowsheds, etc.	—	11 50
Breaches of the Foodshop Byelaws	327	32
Carried forward ..	1,479	87	167	1,225	6,268 15

(98-D)

HEALTH DEPARTMENT.

Return of Prosecutions for Year ending 31st December, 1932—(Contd.)

OFFENCES.	Prosecutions	Withdrawn	Not Served	TOTAL	\$	cts.
					Fines	
Brought forward ..	1,479	87	167	1,225	6,268	15
Markets and Slaughter Houses.					—	—
Possessing flesh of animals not slaughtered in M.C.S. House	2	2	—	—	58	00
Unsound Food .. .. ..	..	..	Section 192	5	—	—
Slaughtering Animals excepts in Abattoirs .. .. ..	..	..	.. .. ..	—	24	50
Market Byelaws .. .. ..	..	..	.. .. ..	—	5	22
Selling human food at unlic. Private Market .. .. ..	..	..	.. .. ..	—	—	50
Sale of Food and Drugs Ordinance No. 139.					11	49
Selling Adulterated Milk .. .. ..	..	..	Section 11-1	46	45	00
„ Milk deficient in fat .. .. ..	..	..	„ 11-1	1	—	—
„ Cosmetic containing Lead Carbonate .. .. ..	..	..	.. .. ..	3	3	98
Q. and P. Disease Ordinance No. 157.					—	—
Failing to report case of Infectious Disease .. .. ..	..	..	Section 3	2	2	30
Moving patient without permission .. .. ..	..	..	„ 15	1	—	00
Exposing patient while suffering .. .. ..	..	..	„ 15	—	—	50
Conveying patient in public vehicle .. .. ..	..	..	„ 19	1	14	50
Carried forward ..			1,602	91	1,321	190
					8,315	65

HEALTH DEPARTMENT.

Return of Prosecutions for Year ending 31st December, 1932—(Cont'd.)

OFFENCES.	TOTAL				\$ cts.
	Prosecutions	Withdrawn	Not Served	Convictions	
Brought forward ..	1,602	91	190	1,321	8,315 65
Failing to have child vaccinated ..	..	..	35	346	0 50
,, bring child for inspection ..	..	..	8	—	—
,,	..	..	..	—	( 100-D)
Registration Births and Deaths Ordinance No. 59.	31	389	—	—	—
Failing to Register Births ..	..	..	—	—	—
,, Deaths ..	..	..	—	—	—
Destruction of Mosquitos Ordinance No. 174.	11	50	—	—	—
Failing to comply with notice ..	..	..	2	2	17 00
Recovery of costs of work done ..	..	..	7-1	—	—
Destroying Anti-malarial Works ..	..	..	14	—	—
Selling aerated Soda water containing less Sodium Bi-carbonate ..	..	28 (1)	2	2	44 00
,, Green Peas containing Copper Sulphate ..	..	..	..	1	—
Pollution of streams with trade refuse ..	..	..	..	1	—
Importing sweetened condensed milk labelling of which is contrary to Reg. 12 (4) ..	..	..	..	1	—
	2,048	99	228	1,721	8,391 15

Summary.

Total Inspections ..	..	..	..	49,628
" Prosecutions ..	..	..	..	2,048
" Withdrawn ..	..	..	..	99
" Not Served ..	..	..	..	228
" Convictions ..	..	..	..	1,721
" Fines ..	..	..	..	\$8,391.15

N.B.—Costs are not included in the amount of fines.

H. J. BENJAFIELD,
Chief Sanitary Inspector.

RETURN OF NOTICES SERVED AND COMPLIED WITH ETC., DURING THE YEAR, 1932.

NATURE OF NOTICE.	Brought forward from last year.	Served during the year.	Total.	Complied with during the year.	Carried forward to next year.	REMARKS.
Intimation Notice	33	913	946
Nuisance Notice	33	291	324
Limewash Notice	157	2,774	2,931
Anti-Mosquito Notice	154	216	370
Latrine Notice	—	1	—
Demolition Order	—	1	—
Abatement Order	4	42	46
Closing Order	—	2	—
Mandatory Order	—	1	—
Total	...	381	4,241	4,622	4,134	237
					251	Cancelled

(101-D)

H. BENJAFIELD,
Chief Sanitary Inspector.

Return of Licences Issued under the Offensive Trade By-Laws for the Year 1932.

(102-D)

Return of Licences Issued under the Offensive Trade By-Laws for the Year 1932.—(Contd.)

(103-D)

DETAILS OF LICENCES ISSUED	Per Annum \$	Number Issued.	CASH RECEIVED										NATURE OF LICENCE.									
			For One Month	For One Year	For One Year & Cts.	\$	cts.	For 3 Months	For 4 Months	For 5 Months	For 6 Months	For 7 Months	For 8 Months	For 9 Months	For 10 Months	For 11 Months	For 12 Months	For 13 Months	For 14 Months	For 15 Months		
Brought forward	416	1,564	48	403	5	2	1	1	1	2	..	1	..	..	..	..	..	..	..	..
CATTLESHEDS, PONYSTABLES, COWSHEDS:																						
9 Animals & Under per head @			1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10—14 Animals	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15—24 ,,,	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25—50 ,,,	25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Over 50 ,,,	50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CATTLESHEDS:																						
9 Animals and under	1	8	00	..	..	..	..	..	..	..	..	..	..	..	..
10—14 Animals	5	41	66	..	..	..	..	..	..	..	..	..	..	..	..
25—50 ,,,	4	87	50	..	..	..	..	..	..	..	..	..	..	..	..
Over 50 ,,,	6	300	00	..	..	..	..	..	..	..	..	..	..	..	..
PONYSTABLES:																						
9 Animals and under	3	13	00	..	..	..	..	..	..	..	..	..	..	..	..
10—14 Animals	1	15	00	..	..	..	..	..	..	..	..	..	..	..	..
25—50 ,,,	1	25	00	..	..	..	..	..	..	..	..	..	..	..	..
COWSHEDS:																						
25—50 Animals	1	25	00	..	..	..	..	..	..	..	..	..	..	..	..
Over 50 ,,,	2	100	00	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL	440	\$2,179	64	403	5	2	1	1	1	2	..	1	..	..	..	..	..	..	..	..

(Sd.) H. BENJAFIELD,

Chief Sanitary Inspector.

